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USDA/FDA EDUCATION INITIATIVE: EVALUATING THE PLACEMENT OF FOOD SAFETY EDUCATION IN AMERICAN SCHOOLS

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**U.S. DEPARTMENT OF AGRICULTURE
FOOD SAFETY AND INSPECTION SERVICE
AND
THE FOOD AND DRUG ADMINISTRATION**

BY:

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MAY 11, 1998

**United States
Department of
Agriculture**



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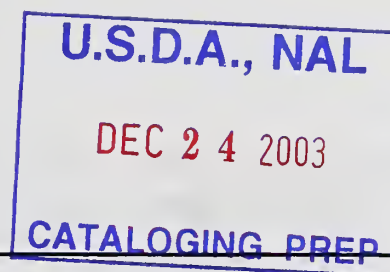


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USDA/FDA EDUCATION INITIATIVE: EVALUATING THE PLACEMENT OF FOOD SAFETY EDUCATION IN AMERICAN SCHOOLS

EXECUTIVE SUMMARY

INTRODUCTION

There is consensus in the public health community that learning safe food-handling habits at an early age benefits health in the short and long term—and yet many children and teens have not received adequate education on the topic of food safety. Ensuring that all students receive such education is critical. Because understanding and practicing proper food safety techniques can significantly reduce food-borne illness, school-age children have been identified as a high-priority group to receive food-safety education under the President's Food Safety Initiative.

Over the years, the Food Safety and Inspection Service (FSIS) at the U.S. Department of Agriculture (USDA/FDA) and the Food and Drug Administration (FDA), have produced a variety of school-oriented programs and materials aimed at various grade levels. USDA/FDA are now about to embark on a large-scale effort to provide young people with food safety information in a school environment. In preparation for this initiative, it is necessary to have a clear understanding of that environment today and in the near future. These questions are critical:

- Where can food safety best be integrated from both grade level and subject matter perspectives?
- What can we hope to accomplish—raise awareness, increase knowledge, change attitudes, develop skills, and/or alter behavior?
- Who will be the primary instructors for food safety instruction—classroom teachers, cafeteria staff, school nurses, or some other group?
- What media and formats will receive greatest acceptance among K-12 educators?

USDA/FDA secured the services of Macro International Inc. (Macro) to conduct research and develop a report that would guide planning of future K-12 food safety education initiatives. The following document describes the project's activities and methodology, presents Macro's findings, and offers recommendations on positioning and delivering food safety education in public schools.

THE HISTORY OF THE CITY OF BOSTON

FROM THE FIRST SETTLEMENT
TO THE PRESENT TIME

BY
JOSEPH NEALE

VOLUME I

BOSTON
PUBLISHED BY
JOSEPH NEALE
1822

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JOSEPH NEALE
1822

PROJECT OVERVIEW

PROJECT ACTIVITIES

Six major activities were conducted in completing this project. These activities included

- *Planning Meeting*—Macro staff met with representatives of USDA/FDA to finalize the overall purpose and goals of the research initiative.
- *Food Safety Instructional Materials Review*—Macro investigated existing curricula, projects, and standards and materials, extension materials, and other educational products related to food safety.
- *Review of Relevant Reports*—Macro reviewed dozens of relevant reports on technology, food safety, school health services, school food services, and other information germane to this study.
- *Curriculum and Instructional Materials Review*—This review included an analysis of the curriculum standards for science, health education, and home economics, as well as major textbooks for these subject areas. Macro reviewed additional high-quality classroom materials (e.g., workbooks, games, computer applications, and Web sites) to identify products on related topics that were well designed and effective.
- *Interviews with Educators and Experts*—Macro staff conducted 24 in-depth interviews with master teachers (of science, health, or home economics at various grade levels), other school staff (such as nurses and food service professionals), and experts on curriculum development and other related topics.
- *Interim and Final Reports*—This report is the final task in this initiative. In it the reader will find a report and analysis of information gathered via the tasks above.

METHODOLOGY

Traditional qualitative research techniques were employed to conduct literature reviews, and one-on-one telephone interviews, and to conduct final data analysis. Semistructured interviews were used to allow for the use of predetermined open-ended questions. Documents were suggested and provided by USDA/FDA for review. Additional materials that were suggested by interview participants, which were identified during other research tasks or serendipitously identified, were located at local libraries and reviewed in situ. Macro developed three semistructured telephone interview protocols for interviews with classroom teachers, content experts, and other school staff. Interviews were all conducted via telephone and lasted approximately 30 minutes each. Teachers and other school-based staff were recruited via a convenience snowball sample. In addition to the teacher and school-based staff interviews, Macro staff conducted interviews with education leaders and curriculum developers. These telephone interviews differed from the interviews with teachers and other school staff in that probes for specific information within each individual expert's domain of expertise were designed.

FINDINGS

DOCUMENT REVIEWS

Reviewing relevant documents allowed an exploration of the multiple aspects and considerations of where to place a food safety message and how to best deliver that message to students. Three primary areas of concentration in the Nation's current education system intuitively relate to food safety messages: science classes, health classes, and family/consumer sciences (home economics) classes. Food safety messages could also be presented and promoted by school health services personnel and food services personnel. There are numerous studies of a wide variety of specific applications for technology in educational settings that show improvements in student performance, student motivation, teacher satisfaction, and other important educational outcomes. Applying existing technology to the delivery of educational messages makes this an exciting time to develop curricula and educational materials. Televisions, computers and the Internet are all excellent ways to reach students with new educational messages. Other uses of technology such as videoteleconferencing and electronic chat capabilities are currently underutilized technologies.

CURRICULUM MATERIALS REVIEW

Middle school and junior high school have more directly related curricula standards for food safety items than does high school. Science, health, and consumer science curricula all offer advantages and disadvantages for the inclusion of food safety elements. Examining science curricula indicated that there are few *obvious* guidelines for linking food safety education, although strong arguments to include food safety messages in science classes can be made. The focus of health education programs over the past decade has been on the reduction of a somewhat narrowly defined set of "risk behaviors"—tobacco use, use of alcohol and other drugs, dietary patterns, sedentary lifestyle, sexual behaviors that result in HIV infection/other sexually transmitted diseases (STDs) and unintended pregnancy; and behaviors that result in intentional (e.g., suicide) and unintentional (e.g., auto accidents) injury. These standards do not contain any topic closely related to food-borne illnesses at the present. The standards for family and consumer sciences now under development are nutrition, food safety, and wellness, so that students can "evaluate nutritional, food safety, and wellness practices to promote individual and family well-being across the life span." Under this overall standard, there are content standards to evaluate the factors affecting food safety from many perspectives.

FOOD SAFETY EDUCATION MATERIALS

A significant number of supplementary curriculum materials have been developed to support instruction on food safety. Some of these are intended for public school students of various ages. Others are considered by their developers to be easily adaptable for use in K-12 classrooms. Macro reviewed 51 products and spoke with eight individuals who had been involved in the development of food safety education materials to ascertain the overall quality and usability of the materials in public education

INTERVIEWS

Interviews with teachers, school health service, and school food service personnel revealed that awareness of food safety issues is high among the individuals interviewed for this study, with the media being the main source of information on the subject. Interviewees all agreed that food safety is an important topic for students to study, but they also confess that little is covered in existing curricula so it is not a priority issue at the present moment.

Much of what is currently being taught about food safety in the schools is covered in family and consumer science courses, with middle school students focused mainly on life skills, and the higher grades concentrating more on vocational training. While educators feel that there is a lack of high-quality educational materials relating to food safety, the materials that do exist come in a variety of formats. Interviewees listed the following as media types that they currently make use of in teaching students about food safety: videos, movies, standard science text books, newspapers, television news reports, the Internet, Governmental materials and campaigns (e.g., *Fight BAC!*TM, and *The Danger Zone*), magazines (e.g., *Science World*), “current events,” posters, radio news broadcasts.

Interview participants discussed the need for activities to be hands on in order to maintain interest in the topic and to engage the students in the lesson. Informants mentioned a wide variety of activities that students really enjoyed. Most agreed that students liked to participate in hands-on activities and that they wanted to be challenged in a variety of ways. All of the interviewees stated that computers were available in their schools, and all were interested in how they could make better use of the technology to deliver food safety and other educational messages.

Most of the interviewees agreed that students were interested in their own health and that for the most part students today were interested in taking steps to take care of themselves. This, they agreed, meant that food safety was likely to be well received by students. Nearly everyone interviewed agreed that middle school grades were the most appropriate place for the food safety messages. While many interviewees agreed that food safety messages could be tailored to any age, grades six through eight were nearly unanimous suggestions as “giving the best bang for the buck.” Most of the teachers and organizational representatives interviewed thought that food service and health services staff could have a limited role in delivering a food safety message to students. The school health services and food services staff who participated in the interviews agreed that they could play an important role, albeit backseat to teachers, in delivering the food safety message.

CONCLUSIONS and RECOMMENDATIONS

The following are conclusions and recommendations that have been reached through the research:

- School officials (e.g., teachers, school health professionals, school food service personnel, and administrators) recognize the need to work new educational initiatives into existing curricula rather than to attempt to introduce new curricula.

- Food safety issues are perfect for thematic units of study in many educational areas including math, science, home economics or family and consumer sciences, health, and other areas within existing school curricula.
- Family/consumer science classes provide an ideal setting for food safety education. The hands-on aspects of the cooking classroom make it ideal for developing food safety habits as well as increasing knowledge about the topic. Not all students, however, are required to take these classes.
- In terms of reaching the most students, science seems to offer the most promise. The analysis of the science curriculum standards indicates where food safety instruction could best fit. However, simple food safety messages are not likely to appeal to or be adopted by science teachers without modifications to make them more “scientific.”
- The middle grades (5 through 8) appear to offer the best opportunities to integrate food safety education into the curriculum for several reasons. Upper elementary school and high school also offer some opportunities, although these should be considered secondary review or enhancement opportunities.
- Refocusing the placement of food safety issues in *Healthy People 2010* to health promotion rather than keeping it in its current position of health protection will make the message more prominent to teachers.
- Work with textbook publishers to ensure that there is adequate and appropriate coverage of food safety topics.
- There is a need to do a thorough, comprehensive review of existing food safety materials and to compile and cross-index a listing of the materials that are considered to be of high quality as a resource guide. This guide should be widely distributed once available.
- There are a limited number of print materials that appear to be of high quality from a content perspective. Those that exist could benefit from an updating to a more attractive format. Such a step should encourage the use of these products.
- Promote the importance of food safety education at various organizational levels—National initiatives that have a trickle-down influence on education (e.g., *National Food Safety Initiatives*, *Healthy People 2000*, *Goals 2000*); groups involved in curriculum standards development for relevant subject areas; regional and State mandates and curriculum frameworks; school district curriculum supervisors; and individual classroom teachers.
- There are few materials that take into account populations with special educational needs. These include populations with limited English proficiency and low literacy skills as well as those who have cognitive or other disabilities. Accommodations should be made to make these materials accessible to all students

- Print, video, and audio materials have a relatively long shelf life—as long as they are sound from a content and design perspective. The same cannot be said for computer applications. Therefore, there is a need to invest carefully in such materials. At the current time, schools seem to be moving strongly to use of the Internet as an informational and instructional resource although it seems likely that CD-ROM will remain important in schools for several years, and a successor (e.g., DVD) will take over once that has been relegated to antiquity.
- Teachers recognize the importance of introducing units of study to students in exciting and innovative ways. Making use of advance technologies such as computer applications, online services, video capabilities, satellite transmissions, and others is one way of capturing student attention and creating excitement around educational messages.
- Special events, such as television programming, video teleconferences, online discussions or “chats” with experts, and other singular and timely “events” can facilitate the presentation of educational messages that are actually eagerly anticipated by students and teachers alike. Given that much of the food safety message can be taught in relatively short timeframes, special event presentation is one excellent way to ensure interest in such an initiative.

I. Introduction

I. INTRODUCTION

INTRODUCTION—*There is consensus in the public health community that learning safe food-handling habits at an early age benefits health in the short and long term—and yet many children and teens have not received adequate education on the topic of food safety. Ensuring that all students receive such education is critical. USDA/FDA are now about to embark on a large-scale effort to provide young people with food safety information in a school environment. In preparation for this initiative, it is necessary to have a clear understanding of that environment today and in the near future. USDA/FDA secured the services of Macro International Inc. (Macro) to conduct research and develop a report that would guide planning of future K-12 food safety education initiatives. The following document describes the project's activities and methodology, presents Macro's findings, and offers recommendations on positioning and delivering food safety education in public schools.*

There is consensus in the public health community that learning safe food-handling habits at an early age benefits health in the short and long term—and yet many children and teens have not received adequate education on the topic of food safety. Ensuring that all students receive such education is critical. At a time when we can no longer assume zero risk in the food supply, many children are now preparing meals and snacks for themselves, and some prepare meals for other members of the family as well. In addition, millions of teens are working in the food service industry where a basic understanding of food safety is essential to the health of the general public.

Because understanding and practicing proper food safety techniques can significantly reduce food-borne illness, school-age children have been identified as a high-priority group to receive food-safety education under the President's Food Safety Initiative. Providing school-based education is a promising route for delivering this instruction to all children, and yet such an initiative is not without its pitfalls.

Over the years, the Food Safety and Inspection Service (FSIS) at the U.S. Department of Agriculture (USDA/FDA) and the Food and Drug Administration (FDA) at the U.S. Department of Health and Human Services (HHS), have produced a variety of school-oriented programs and materials aimed at various grade levels. In recent years, as concern about food safety has increased, several school-based projects have been conducted. Examples of these projects can be found in Appendix A.

USDA/FDA, working with the Centers of Disease Control and Prevention (CDC), are now about to embark on a large-scale effort to provide young people with food safety information in a school environment. In preparation for this initiative, it is necessary to have a clear understanding of that environment today and in the near future. These questions are critical: Where can food safety best be integrated from both grade level and subject matter perspectives? What can we hope to accomplish—raise awareness, increase knowledge, change attitudes, develop skills, and/or alter behavior? Who will be the primary instructors for food safety

instruction—classroom teachers, cafeteria staff, school nurses, or some other group? What media and formats will receive greatest acceptance among K-12 educators?

With limited funding, there is a need to plan strategically and to justify decisions about both development of new projects and additional promotion of existing programs. USDA/FDA secured the services of Macro International Inc. (Macro) to conduct research and develop a report that would guide planning of future K-12 food safety education initiatives. The following document describes the project's activities and methodology, presents Macro's findings, and offers recommendations on positioning and delivering food safety education in public schools.

II. Project Overview

II. PROJECT OVERVIEW

A. Project Activities

Project Activities—Six major activities were conducted in completing this project. These activities included

- *Planning Meeting*—Macro staff met with representatives of USDA/FDA to finalize the overall purpose and goals of the research initiative.
- *Food Safety Instructional Materials Review*—Macro investigated existing curricula, projects, and standards and materials, extension materials, and other educational products related to food safety.
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- *Interviews with Educators and Experts*—Macro staff conducted 24 in-depth interviews with master teachers (of science, health, or home economics at various grade levels), other school staff (such as nurses and food service professionals), and experts on curriculum development and other related topics.
- *Interim and Final Reports*—This report is the final task in this initiative. In it the reader will find a report and analysis of information gathered via the tasks above.

This report and the specific recommendations within are based on the results from a number of activities. These activities include

- Planning Meeting
- Food Safety Instructional Materials Review
- Review of Relevant Reports
- Curriculum and Instructional Materials Review
- Interviews with Educators and Experts
- Interim and Final Reports.

Each of these activities is briefly described below. Discussion and analysis of the findings from each of these activities follows as the remainder of this report.

1. PLANNING MEETING

Macro staff met with representatives of USDA/FDA to finalize the overall purpose and goals of the research initiative. At that meeting, timelines for deliverables were established and goals and expectations for the project were discussed. When all parties were satisfied with the research plan, Macro commenced work on the project.

2. FOOD SAFETY INSTRUCTIONAL MATERIALS REVIEW

Macro investigated existing curricula, projects, and standards and materials recommended and made available by the USDA/FDA. Additional products and curricula, including extension materials, were located at various libraries in the Washington, DC, area. Still other materials were secured from participants in structured interviews and through serendipitous discovery. Reviewing these materials and information helped Macro determine which elements of food safety knowledge are currently being addressed in schools and in other educational settings.

3. REVIEW OF RELEVANT REPORTS

Macro reviewed dozens of relevant reports on technology, food safety, school health services, school food services, and other information germane to this study. This review focused primarily on reports related to various aspects of the school environment that relate to the placement of food safety instruction in public schools. For example, knowledge of the technology available to support instruction is essential, so a careful review of the current literature on technology use in schools was conducted. Similarly, an understanding of school health policies and practices in schools, including the specific responsibilities of various staff (e.g., school nurse, and food service personnel) is critical to the success of any food safety instruction initiative. Documents produced by Macro and other professional research firms, Government agencies, and private-sector companies were reviewed.

4. CURRICULUM AND INSTRUCTIONAL MATERIALS REVIEW

Macro conducted a review of curricula and materials to increase understanding of the content typically covered in the subject areas and grades being considered. This review included an analysis of the curriculum standards for science, health education, and home economics, as well as major textbooks for these subject areas. Macro reviewed additional high-quality classroom materials (e.g., workbooks, games, computer applications, and Web sites) to identify products on related topics that were well designed and effective. We paid particular attention to materials on health-related topics (e.g., sex education, drug education, and nutrition).

5. INTERVIEWS WITH EDUCATORS AND EXPERTS

Macro staff conducted 24 in-depth interviews with master teachers, other school staff, and experts on curriculum development and other related topics. Interviews were conducted with school-based staff, including teachers of science, health, or home economics at various grade levels, and other staff such as nurses and food service professionals. We also conducted followup interviews as needed with experts identified through the various document reviews to further explore some issues and to ensure that the published information was the most accurate and timely available. These experts included representatives of professional associations such as

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1876-1877

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the American Association of Family and Consumer Sciences, National Science Teachers Association, American Academy for the Advancement of Science, American School Nurses Association, and the American Association of State Directors of School Lunch Programs.

6. INTERIM AND FINAL REPORTS

This report is the final task in this initiative. In it the reader will find a report and analysis of information gathered via the tasks above. The report contains:

- Background summaries of the document reviews and of the interviews with educators and experts
- Descriptions of features of school environments that are directly related to decisions about placement of food safety education (e.g., technology infrastructure; staffing patterns; and content coverage and instructional approaches in science, health, and home economics)
- Descriptions of the advantages and disadvantages of identified placement approaches, including the cost implications for using various kinds of media and materials
- Recommendations for most promising approaches to the placement of food safety instruction in schools.

B. Methodology

Methodology—Traditional qualitative research techniques were employed to conduct literature reviews, and one-on-one telephone interviews, and to conduct final data analysis. Semistructured interviews were used to allow for the use of predetermined open-ended questions. Documents were suggested and provided by USDA/FDA for review. Additional materials that were suggested by interview participants, which were identified during other research tasks or serendipitously identified, were located at local libraries and reviewed in situ. Macro developed three semistructured telephone interview protocols for interviews with classroom teachers, content experts, and other school staff. Interviews were all conducted via telephone and lasted approximately 30 minutes each. Teachers and other school-based staff were recruited via a convenience snowball sample. In addition to the teacher and school-based staff interviews, Macro staff conducted interviews with education leaders and curriculum developers. These telephone interviews differed from the interviews with teachers and other school staff in that probes for specific information within each individual expert's domain of expertise were designed.

I. QUALITATIVE RESEARCH METHODS

Traditional qualitative research techniques were employed to conduct literature reviews, and one-on-one telephone interviews, and to conduct final data analysis. Semistructured interviews were used to allow for the use of predetermined open-ended questions. These questions ensured that individual's responses were unconstrained by the interviewer. This lack of constraint was

especially important since many responses led to new avenues of inquiry not previously identified by the interviewers.

2. DOCUMENT REVIEWS

Documents were suggested and provided by USDA/FDA for review. Additional materials that were suggested by interview participants, which were identified during other research tasks or serendipitously identified, were located at local libraries and reviewed in situ. Detailed notes were taken regarding food safety issues, content of the materials, overall quality of the materials, and other factors of consideration. During some later interviews, respondents were asked to comment on some items that may have been familiar to them.

3. INTERVIEWS

Protocol Development

Macro developed three semistructured telephone interview protocols for interviews with classroom teachers, content experts, and other school staff. In selecting interview candidates, we carefully worked to ensure diversity in terms of subject matter focus, district size, urbanicity of district, grade levels of students, ethnicity, and gender. Interviews were all conducted via telephone and lasted approximately 30 minutes each. The protocols used in the study were designed to elicit information around the following topic areas:

- Is there an advantage within the public school system of focusing food safety education as more of a health issue, a home economics issue, or a science issue?
- Where would food safety instruction have the best chance of finding support in the school environment?
- Would the concept of food safety education find greater support among classroom teachers or among school support staff (i.e., nurses or food service staff)?
- In which grade or grades should food safety education efforts be focused?
- Should the educational goal be to raise awareness, increase knowledge, change attitudes, or modify behavior,—or is there some other focus?
- At what age/grade level are students most receptive to learning about safe food handling techniques?
- What approaches are most compatible with current instructional practices and will encourage maximum usage of a food safety education program?
- What technologies are schools using most, and what formats do teachers and students prefer?

Copies of the three teacher interview protocols can be found in Appendix A.

THE UNIVERSITY OF CHICAGO
DIVISION OF THE PHYSICAL SCIENCES
DEPARTMENT OF CHEMISTRY

REPORT OF THE
COMMISSION ON THE
STRUCTURE OF THE
ATOMIC NUCLEUS

PRESENTED TO THE
ACADEMY OF NATURAL SCIENCES
OF THE UNITED STATES OF AMERICA

BY
THE COMMISSION ON THE
STRUCTURE OF THE
ATOMIC NUCLEUS

CHICAGO, ILLINOIS
1950

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1950

Teachers and other school-based staff were recruited via a convenience snowball sample, starting with teachers who came highly recommended or whose names repeatedly appeared in curriculum and materials review documents (e.g., as advisors). Following initial interviews with these individuals, respondents were asked to suggest colleagues—including those colleagues working in other districts and States—who might be willing to participate in the study. This sampling procedure continued until all interviews were completed.

In addition to the teacher and school-based staff interviews, Macro staff conducted interviews with education leaders and curriculum developers. These telephone interviews differed from the interviews with teachers and other school staff in that probes for specific information within each individual expert's domain of expertise were designed. For example, in speaking with representatives of the School Nurses Association, we sought additional information about staffing patterns for school nurses nationwide, typical responsibilities of school nurses, level of involvement in providing instruction to students, and any related initiatives of the association, among other items. Each interview was thoroughly planned in advance, although no formal protocol was developed for these interviews. These interviews lasted approximately 30 to 45 minutes.

III. Findings

III. FINDINGS

A. Document Reviews

Document Reviews—Reviewing these documents allowed us to explore the multiple aspects and considerations of where to place a food safety message and how to best deliver that message to students. Three primary areas of concentration in the Nation's current education system intuitively relate to food safety messages: science classes, health classes, and family/consumer sciences (home economics) classes. Food safety messages could also be presented and promoted by school health services personnel and food services personnel. There are numerous studies of a wide variety of specific applications for technology in educational settings that show improvements in student performance, student motivation, teacher satisfaction, and other important educational outcomes. Applying existing technology to the delivery of educational messages makes this an exciting time to develop curricula and educational materials. Televisions, computers and the Internet are all excellent ways to reach students with new educational messages. Other uses of technology such as videoteleconferencing and electronic chat capabilities are underutilized technologies.

I. REVIEW OF RELEVANT REPORTS

In conducting this research, Macro examined numerous reports on the current state of school health services, school food services, and technology in schools in an effort to determine where the food safety message could best be placed and how it could best be delivered. For example, an understanding of school health policies and practices in schools, including the specific responsibilities of various staff (e.g., school nurse, and food service personnel) is critical to the success of any food safety instruction initiative. Similarly, knowledge of the technology available to support instruction is essential. A list of the documents, studies, and reports that Macro reviewed in preparing this analysis can be found in Appendix B.

Reviewing these documents allowed us to explore the multiple aspects and considerations of where to place a food safety message and how to best deliver that message to students.

Understanding the Possible Positioning of a Food Safety Message

Food safety messages already exist in many areas of curricula in our middle/junior, high, and senior high schools nationwide. Three primary areas of concentration in the Nation's current education system intuitively relate to food safety messages: science classes, health classes, and family/consumer sciences (home economics) classes. Food safety messages could also be presented and promoted by school health services personnel and food services personnel. Currently there are initiatives in many schools and school districts to increase coordination and collaboration among school health services, school food services, and classroom staffs.



School Health Services

New paradigms are evolving for school health services as school systems develop comprehensive school health programs to address the diverse and complex health problems of today's students. Increasingly, educators recognize that physical and psychological health have a direct affect on children's ability to learn. Although the full potential of school health services has yet to be realized, its place as a critical component of the educational system is well established.

According the School Health Policies and Programs Study (SHPPS, 1995) conducted by the Centers for Disease Control and Prevention, more than half (57.3 percent) of all middle/junior, high, and senior high schools have at least one registered nurse providing services to the school. Twelve percent of the Nation's schools have at least one health aide serving the building, and 7.7 percent have at least one licensed practical nurse providing school health services. While the SHPPS report seems to indicate that there is a large critical mass of health service personnel in schools nationwide, it is important to recognize that many school health personnel are part-time employees in any given school and possibly make only a single visit to each school in a district each week. Their time and energy is spread very thinly over a variety of responsibilities and activities. Many of these health services personnel work in multiple buildings in their communities or school districts, limiting the time that they can commit to any one school. It is not uncommon for RN's, LPN's or health aides to travel throughout their school district spending 1 day or less at each of the schools in the area.

School health services personnel are involved in a variety of activities and initiatives in their districts, each staff member often serving as the only health professional for multiple schools. In addition to being taxed by schedules and distances, school health professionals also wear a variety of hats in their positions. For example, the 1995 SHPPS report lists the following as health services at the school level: student health screening, medication administration, health records and reporting, first aid, evaluation of sick students, special needs students, and other services. The category of "other services" is further broken down into the following activities: alcohol and other drug rehabilitation, condom distribution, family counseling, group counseling, individual counseling, nutrition and weight management, pregnancy management, pregnancy prevention and family planning, pregnancy testing, primary health care, sexually transmitted disease diagnosis and treatment, suicide prevention, and tobacco cessation.

Clearly school health services staff are taxed in the demands placed on them in district and school settings. But even with all of these expectations, school health personnel are asked to do more. In addition to the variety of responsibilities listed above, the ASHA Guidelines for Comprehensive School Health Programs call for school health services to be coordinated with other components of the school health program and with local and State governmental and nongovernmental organizations. Between 1993 and 1995, health services staff in 61.4 percent of all middle/junior, high, and senior high schools had organized health-related activities or projects with staff from other components of the school health program. Nationwide, 52.4 percent of the states and 27.8 percent of districts¹ have had school health services staff involved in joint

¹ All 51 State education agencies (100 percent) completed the State-level questionnaires. Results: 413 (82 percent) of the 502 sampled districts completed at least one questionnaire, and 607 (79 percent) of the 766 sampled schools completed the interviews. Percentages are based on these response rates.

activities or projects with school food service staff during the previous 2 years. While collaboration occurred most often with staff in health education, 28.2 percent of these schools had established collaborative projects between school food services and school health services. Most of this interaction involved teaching proper nutrition to students, although some food safety messages were also reported. The SHPPS report, however, is unclear as to the extent to which food safety messages are a part of such collaborations.

School health services are a critical component of the school health program. However, currently the roles, responsibilities, and training of health services staff in schools are not as well defined as the requirements for specific services. For instance, secretaries, teachers and students administer prescription medication in many schools and provide first aid in most schools. Despite the expanding role of school health services, clear consensus on the role of health professional in the education setting does not exist. This should be considered in deciding school health services role in the delivery of a food safety message. While school health services staff is required to collaborate with the educational initiatives of their schools, they are more likely to be in a position to participate in food safety education in a support role. As guest speakers to science, health, and consumer and family science classrooms they can have significant impact on students. The placement of educational materials relating to food safety messages in school health clinics, school sick rooms, and school nurse offices is another way they can participate.

School Food Services

Although schools have been providing meals to students for more than 50 years, Federal requirements for school meals have not changed significantly until recently. New initiatives by USDA/FDA reflect the general public's interest in improving school meals and in knowing the latest scientific evidence that school meals can make a significant contribution to the current and future health of the Nation's children

Schools are in a unique position to promote healthy dietary behaviors and to help assure appropriate nutrient intake. As one component of a comprehensive school health the program, the school food service can reinforce nutrition education and provide opportunities for students to practice healthful food choices. Schools' food service staff play a critical role in promoting healthy eating through the foods they make available each day and the interactions they have with students.

Federal support for school meals and nutrition education has a long history. Congress authorized the National School Lunch Program (NSLP) in 1946 and established the School Breakfast Program (SBP) as a pilot program in 1966. The SBP was authorized as a permanent program in 1975. In 1977, the Child Nutrition Amendment to the School Lunch Act established the Nutrition Education and Training (NET) Program. The NET Program was designed to teach children, through a positive daily lunchroom experience and appropriate classroom reinforcement, the value of a nutritionally balanced diet, and to develop curricula and materials for training teachers and school food service staff to carry out this task. In 1994, USDA/FDA initiated the School Meals Initiative for Healthy Children, which was designed to help children select and enjoy meals consistent with the DGAs and which was supported by partnerships among the agriculture, food production, media, education, and health communities.



In 1995, SHPPS reported that coordination and collaboration between school lunch service personnel and school teaching staff was occurring. Between 1993 and 1995, most (98 percent) States helped districts and schools coordinate nutrition education between the cafeteria and the classroom, and about half (53.3 percent) of the districts assisted schools with the same activities. More than two thirds of all States provided ideas for nutrition-related events (88.2 percent), strategies to involve food service staff in classrooms (74.5 percent), and strategies to use the cafeteria as a learning laboratory (70.6 percent). About one third (34.3 percent) of all districts provided ideas for nutrition-related events, and 24.0 percent provided strategies to involve food service staff in classrooms.

During this same period, food service staffs in 91.8 percent of all States and 41.5 percent of all districts were involved in joint activities or projects with staff from other components of the school health program. Among the State-level food service staff reporting joint activities, more than half were involved with health education staff (75.6 percent). Among the district-level food service staff reporting joint activities, more than half were involved with health education staff (58.3 percent).

Statewide, 84.3 percent of all states offered training in the coordination of food service programs with nutrition education (37.0 percent district), and 74.5 percent provided accompanying materials (34.5 percent district). Strategies for this coordination included the following: provide ideas for special nutrition-related events, provide strategies to involve food service staff in classrooms, provide strategies to use the cafeteria as a learning laboratory, arrange joint in-service training on nutrition education for food service staff and classroom teachers, and arrange regular meeting on nutrition education between food service staff and classroom teachers. In 75.6 percent of all states and 58.3 percent of all districts, school food service staff were involved in joint activities or projects with health education staff. School food service staff collaborated with health services staff in 48.9 percent of States and in 26.7 percent of districts, respectively. Schools occasionally collaborated with one another as well. SHPPS reported that 24.7 percent of the school food services participated with other schools health education staffs, and 23.3 percent participated with other schools' health services departments. However, only 19.1 percent of all middle/junior, high, and senior high schools reported that students visited the cafeteria to learn about healthy snacks and meals during the past year. In 10.2 percent of all schools, family and consumer science classes visited the cafeteria, while health education, science, and physical education classes each visited the cafeteria in less than 3 percent of all schools.

Between 1993 and 1995 food service staff were guest speakers in classrooms in 21.3 percent of all middle/junior, high, and senior high schools. Similarly, food service staff met with classroom teachers to coordinate nutrition education in 19.0 percent of all schools during this same time period. SHPPS also reported that between 1993 and 1995 food service staff in 33.8 percent of all middle/junior high and senior high schools organized health-related activities or projects with staff from other components of the school health program.

During the same time period, food service staff in 33.8 percent of all middle/junior, high, and senior high schools organized health-related activities or projects with staff from other components of the school health program. Integration of cafeteria staff with classroom nutrition education is minimal. Although coordination and collaboration among school food service staff and other school health program component staff is identified as a key to increasing the quality

of food service, a marked decrease in collaboration occurs from the State to the district to the school. Collaboration appears a reality more often among State and district administrators than among actual meal providers. Justification and strategies for increasing collaboration, particularly between the classroom and cafeteria, with input from local meal providers are needed if collaboration at the school level is to move beyond theory into practice.

While it is unclear the extent to which such coordination and collaboration between health services, food services, and classroom staff incorporate specific food safety messages, clearly there is a structure in place to introduce food safety messages into these collaborations.

Technology In Schools

There are numerous studies of a wide variety of specific applications for technology in educational settings that show improvements in student performance, student motivation, teacher satisfaction, and other important educational outcomes. Examples of technology-rich schools that report significant improvements in student motivation, academic outcomes, and other outcomes such as problem solving or collaboration are also common in the literature. With the rapid changes in technology, the falling costs for high-end computers and video equipment, and the advent of Internet use in educational setting, traditional ways of assessing the effectiveness of educational programs are generally deficient for assessing the contribution of technology. The impact that technologies of all kinds have on the educational experience is tremendous. The role that any advanced technology can play in delivering food safety messages is yet to be determined. One known factor in using advanced technology to deliver pedagogical information is that proper, well-designed implementation of any product or tool is crucial to the successful application of technology in education.

Regardless of the technology being used, any positive outcomes for students will naturally be limited by the number of students who can be reached. This limitation is perhaps most obviously true for computer technology. Advances in the use of the Internet, local-area networks (LANs), wide-area networks (WANs), World Wide Web Internet services, video teleconferencing, and other technologies make information more available than ever before to students nationwide. These advances in technology also allow for wide dissemination of educational messages in relatively short timeframes. Applying existing technology to the delivery of educational messages makes this an exciting time to develop curricula and educational materials.

There are many justifications for the use of computer technology in educational environments:

- Tailor learning experiences more sharply to learner needs and abilities
- Provide students with access to resources and expertise outside the school, both enriching their learning and extending the time devoted to learning
- Support more authentic assessment of a student's progress
- Assist schools in managing and guiding the learning activities of their students (Glennan and Melmed, 1995).

Current Use and Effectiveness of Educational Technology

Schools have often been sites of certain kinds of innovations. However, the efforts of schools, their teachers, administrators, and students are often hampered by a cost-effectiveness assessment. The current status of computers and other technology in schools suggests an increasing recognition of their value for instruction. Yet, as Glennan and Melmed (1995) observe, "use of technology to significantly affect classroom practice tends to be limited to small groups of teachers who are excited by the potential that they feel technology has to motivate their students or to access new resources." These authors point out that the adoption of computer and video technology is likely to continue to increase as more real educational benefits are identified.

Televisions

Nearly all schools in the United States today have television sets and videocassette recorders, making use of videotapes in the classroom a possibility in virtually all schools. According to the Study of School Uses of Television and Video (Corporation for Public Broadcasting, 1997), 99.5 percent of classroom teachers nationwide have access to televisions for use with their students. The same report states that 98.5 percent have access to videotape players.

Computers

In 1983 there was about one computer for each 125 students in the Nation's public schools. By 1995, there was a computer for each nine students. The CPB report states that 93.7 percent of schools nationwide have computers available for classroom use. On the average, schools nationwide have 32 computers for student use, 22 of which have CD-ROM capabilities. Nationwide, 74.6 percent of teachers report using computers in classroom instruction, and 63.4 percent report using CD-ROMs for instruction. In 1994, the Nation's schools spent about \$3 billion on computer- and network-based technology. Additional funds were spent for other kinds of equipment, such as video players, facsimile machines, and telephone lines, as well as for technology-related training" (Glennan and Melmed, 1995). Research and practice suggest that, appropriately implemented, computer- and network-based technology can contribute significantly to improved educational outcomes (Glennan and Melmed, 1995).

The increasing use of computers in schools makes a high quality computer-based food safety instructional application an attractive idea.

Educational software is typically understood as tool applications or content applications. Tools include word processors or spreadsheet programs. Content applications are stand-alone programs whose objective is to deliver content, not necessarily increase the functionality of computer hardware. Glennan and Melmed (1995) note that tool applications are typically developed for commercial audiences while content applications are created with the school market in mind. The implication is that schools, with a need for high-quality content applications, suffer from these market forces. "The market for educational materials, as traditionally structured, offers limited incentives for entrepreneurial development of content software. The market is fragmented and governed by a variety of materials adoption practices. Even if a high proportion of schools acquires a product, the volume of sales is small (Glennan and Melmed, 1995). The responsibility for creating high quality content applications falls to programmers motivated by something other than profit margins. This situation is particularly true with the more specialized subject areas characteristic of much of secondary education.

However, this situation may be changing. New alliances among publishers and a spectrum of software developers the rapid growth in the National information infrastructure coupled with its potential for changing the manner in which software is distributed, and the emergence of new entrepreneurs, all promise significant changes in the manner in which schools acquire and use instructional materials and content software.

According to Anderson et al. (1997), it is in everyone's interest to increase access to computer and telecommunications technology. Anderson notes that computer and related technologies can improve people's participation in a variety of economic, social, and civic activities. For example, computer users tend to be better informed about political events. Further, use of computer networks tends to foster different kinds of social ties. This increased social integration has concomitant benefits to the strength of the society as well as to the well-being of its individual members. Finally, participation in computer networks allows for more egalitarian interactions than do other kinds of social organizations, accruing benefits to decision-making processes that seek an ideal democratic model of participation. "That is, for online groups, ascribed and achieved status characteristics such as age, race, gender, formal position or title, and socioeconomic level are far less likely to determine interaction patterns, leadership roles, decision making influence, and other outcomes in comparison to groups that meet in person" (Anderson et al., 1997).

While schools are continuing to increase the number and kind of instructional technology, broad differences between districts and within districts remain. Further, differences within schools, related to differential student access to technologies, complicates simplified statistics related to gross number of computers in schools or average ratios of students to computers. For example, the largest push for computers in the schools happened in the late 1980s, meaning much of the school technology is now over 10 years old. While keyboarding and related skills can easily and effectively be taught on this technology, they remain unable to access current computer applications simply because the lack of hard drives (Glennan and Melmed 1995).

In order for every student to have 30 minutes of computer time a day, there would need to be one computer for every five students, assuming a 5-hour school day. However, "in the fall of 1994, only 3 percent of the Nation's K-12 students were in schools that had at least one computer for every five students, a density that those advocating the benefits of technology-intensive schools judge barely adequate" (Glennan and Melmed, 1995).

Small schools (with 1 to 299 students) are more likely to have a lower number of students per computer than large schools (with 750 or more students). Citing Becker (1994), Glennan and Melmed (1995) note that regional difference, community type, and school ethnic makeup were far less significant a source of technology access difference than size of school. There is "a continuing penetration of computers in the nation's schools but considerable variation among schools and districts. The combination of steady acquisition and accumulation of equipment by schools in a period of rapid technological change suggests that much of the school computer inventory is technologically obsolete although it may retain considerable educational usefulness. Overall, while the rate of penetration for schools serving minority and poverty populations is somewhat lower than average, the difference appears not to be extreme" (Glennan and Melmed, 1995).

Computer technology in academic subjects is typified by tool applications being used to meet an end, and content applications providing supplemental instruction. Computer technology in computer education classes is typified by students' being instructed in how to use tool applications and few content applications' being available. Judged as a proportion of student computer time devoted to different subject areas, the majority (about 54 percent) of computer use at elementary levels is in academic subjects. A third of computer time is spent in computer class. At the high school level, this pattern is reversed, where 45 percent of computer time is spent in computer class is likely spent learning tool applications. In contrast, 31 percent of computer time is spent in academic subjects. "School is still primarily a place to learn how to use word processing rather than a place to do word processing in order to achieve other academic goals" (Glennan and Melmed, 1995). There is a "strong indication of the relatively infrequent use of computers in secondary school academic subjects" (Glennan and Melmed, 1995).

Educational researchers agree that students achieve benefits from using technology in learning. For example, Kulik draws the following conclusions from his work:

- Students usually learn more in classes in which they receive computer-based instruction.
- Students learn their lessons in less time with computer-based instruction.
- Students also like their classes more when they receive computer help in them.
- Students develop more positive attitudes toward computers when they receive help from them in school.

Computers did not, however, have positive effects in every area in which they were studied. The average effect of computer-based instruction in 34 studies of attitude toward subject matter was near zero.

Thus, at the program, project, and classroom level, there is solid evidence that instructional activities making intensive use of technology can lead to significant improvements in student achievements.

With regard to instructional practice Means and Olson (year?) found that technology supported improved instruction by:

- Adding to students' perceptions that their work is authentic and important
- Increasing the complexity with which students can deal successfully
- Dramatically enhancing student motivation and self-esteem
- Making obvious the need for long blocks of [instructional] time
- Instigating greater collaboration, with students helping peers and sometimes their teachers
- Giving teachers additional impetus to take on a coaching and advisory role.

Internet

Web access has increased dramatically in the past 2 years, and many schools are planning to gain access for the first time or increase access (i.e., install computers with Internet access in additional classrooms). The CPB report states that 48.7 percent of schools nationwide have (LAN) available for students, and over 40 percent of schools make Internet connections available to their students. Teachers report that incorporating computers into instruction increases student motivation and enthusiasm, with 81.9 percent of teachers nationwide stating that there are noticeable improvements with their students in these areas. Over 71 percent of teachers state that their students prefer using computers in instruction to any other media or classroom tool.

According to the U.S. Departments of Education and Commerce (1994) while 75 percent of public schools have access to some kind of computer network, only 49 percent have access to a wide-area network—35 percent of public schools have access to the Internet, and 14 percent have access to other wide-area networks (e.g., CompuServe, America Online, Prodigy).

B. Curriculum Materials Review

Curriculum Materials Review—Examining science curricula indicates that there are few obvious guidelines for linking food safety education. Middle school and junior high school have more directly related curricula standards for food safety items than does high school. The focus of health education programs over the past decade has been on the reduction of a somewhat narrowly defined set of "risk behaviors"—tobacco use, use of alcohol and other drugs, dietary patterns, sedentary lifestyle, sexual behaviors that result in HIV infection/other Sexually transmitted diseases (STDs) and unintended pregnancy; and behaviors that result in intentional (e.g., suicide) and unintentional (e.g., auto accidents) injury. These standards do not contain any topic closely related to food-borne illnesses. The standards for family and consumer sciences now under development are nutrition, food safety, and wellness, so that students can "evaluate nutritional, food safety, and wellness practices to promote individual and family well-being across the life span." Under this overall standard, there are content standards to evaluate the factors affecting food safety from production through marketing, analyze food-borne illness as a health issue for individuals and families, demonstrate safe consumer practices for handling food to reduce the incidence of food-borne illness for individuals and families, analyze information on product labels that have food safety implication for individuals and families, evaluate the impact of science and technology on food composition and safety, nutrition, and wellness of individuals and families, and contribute to the public dialogue about food safety and sanitation.

In this section we present our analysis of relevant curriculum standards and instructional materials for science, health, and family/consumer science.

I. SCIENCE EDUCATION CURRICULUM STANDARDS

Standards for science education were developed by the National Research Council with the participation of educators nationwide. They are published in the *National Science Education Standards* (NSES). These standards specify that science will be taught to all students and that learning will be an active process in which students construct their own understanding of scientific concepts and principles. In the process, students are to establish connections between

their current knowledge of science and the scientific knowledge found in many sources. This emphasis on active science learning involves shifting emphasis away from teachers presenting information, and making sure students cover a wide range of science topics. The standards document states:

The perceived need to include all the topics, vocabulary, and information in textbooks is in direct conflict with the central goal of having students learn scientific knowledge with understanding. Scientific literacy is the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. The content standards set forth are not intended to be curriculum. However, they do provide some insight into those concepts and skills that children are to develop at various grade levels.

For children in grades K-4, one NSES content standard states

As a result of activities in grades K-4, all students should develop understanding of: the characteristics of organisms, life cycles of organisms, and organisms and environment.

More specifically, this process involves acquisition of concepts that may be relevant for food safety education:

- Organisms have basic needs.
- Organisms can survive only in environments in which their needs can be met.
- All organisms cause changes in the environment where they live.
- Some of these changes are detrimental to the organism or to other organisms, whereas other changes are beneficial.

Another NSES standard for the early elementary grades is

As a result of activities in grades K-4, all students should develop understanding of: personal health, characteristics and changes in population, types of resources, changes in environments, and science and technology in local challenges.

More specifically, this process involves acquisition of the following concepts:

- Individuals have some responsibility for their own health. Students should engage in personal care—dental hygiene, cleanliness, and exercise—that will maintain and improve health. Understandings include how communicable diseases such as colds are transmitted and how some of the body's defense mechanisms prevent or overcome illness.
- Nutrition is essential to health. Students should understand how the body uses foods and how various foods contribute to health

There are some challenges in teaching young children about microorganisms and about health. Related to health, the NSES note that

Most children use the word “germs” for all microbes; they do not generally use the words “virus” or “bacteria,” and when they do they do not understand the difference between the two. Children generally attribute all illnesses to germs without distinction between contagious and noncontagious diseases...Teachers can expect students to exhibit little understanding of ideas, such as different origins of disease, resistance to infection, and prevention and cure of disease...Also, young children link eating with growth, health, strength, and energy. Teaching them that not all food is good for them presents some challenges. They are able to understand that some foods are nutritionally better than others—although they do not typically know the reasons for these conclusions.

The National Science Education Standards state that students in grades five through eight can begin to recognize the relationship between explanation and evidence. Thus, students in this age group are to be actively involved in scientific inquiry through a variety of hands-on learning experiences. The single standard for life science in these grades is states in the NSES:

As a result of their activities in grades 5-8, all students should develop understanding of: structure and function in living systems, reproduction and heredity, regulation and behavior, populations and ecosystems, and diversity and adaptations of organisms.

Among other things, this understanding involves acquisition of the following knowledge:

- All organisms are composed of cells—the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.
- Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This process requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.
- The human organism has systems for digestion, respiration, reproduction, circulation, excretion, movement, control, coordination, and protection from disease. These systems interact with one another.
- Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage from infection by other organisms.
- Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some microorganisms are producers—they make their own food. All animals, including humans, are consumers that obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for

food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.

Another NSES standard for science in the middle grades relates to personal and social perspectives on science.

As a result of activities in grades 5-8, all students should develop understanding of: personal health, populations, resources, and environments; natural hazards, risks and benefits; and science and technology in society.

Relevant in terms of food safety education opportunities include the following:

- The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions...
- Risk assessment considers the type of hazard and estimates the number of people that might be exposed and the number likely to suffer consequences. The results are used by risk managers to determine the options for reducing or eliminating risks.
- Students should understand the risks associated with natural hazards ..., with chemical hazards ..., with biological hazards (pollen, viruses, bacteria, and parasites), with social hazards ..., and with personal hazards...

The NSES standards mention two important aspects of early adolescence that relate to food safety education opportunities. The standards document states that

This period of development lends itself to human biology. Middle-school students can develop the understanding that the body has organs that function together to maintain life.

The National Science Education Standards further state that—

By middle school, students begin to realize that illness can be caused by various factors, such as microorganisms, genetic predispositions, malfunctioning of organs and organ-systems, health habits, and environmental conditions...One very important issue for teachers in grades 5-8 is overcoming students' perceptions that most factors related to health are beyond their control. Developing a scientific understanding of health is the focus of this standard. Healthy behaviors and other aspects of health education are introduced in other parts of school programs.

By high school many students have developed a sound foundation for scientific inquiry while developing sophistication in their abilities and understanding of scientific inquiry. The NSES standards point out that

One challenge to teachers of science and to curriculum developers is making science investigations meaningful. Investigations should derive from

questions and issues that have meaning for students. Scientific topics that have been highlighted by current events provide one source.

The NSES life science standard for high schools is

As a result of their activities in grades 9-12, all students should develop understanding of: the cell, molecular basis of heredity; biological evolution; interdependence of organisms; matter, energy, and organization in living systems; and behavior of organisms.

Under this standard, there are few obvious guidelines for linking food safety education. The emphasis in high school on life science is on incorporating more abstract knowledge—such as the structure and function of DNA—and more comprehensive theories such as evolution. Although there is a fair amount of attention paid to the cell in high school biology, the emphasis is on genetics, the function of various parts of individual cells, and the operation of ecosystems.

The NSES standard for personal and social perspectives may offer more opportunities for food safety education at the high school level:

As a result of activities in grades 9-12, all students should develop understanding of: personal and community health; population growth; natural resources; environmental quality; natural and human-induced hazards; and science and technology in local, national, and global challenges.

Relevant in terms of food safety education opportunities are the following:

- Hazards and the potential for accidents exist. Regardless of the environment, the possibility of injury, illness, disability, or death may be present. Humans have a variety of mechanisms ...that can reduce and modify hazards.
- The severity of disease symptoms is dependent on many factors such as human resistance and the virulence of the disease-producing organism. Many diseases can be prevented, controlled, or cured. Some diseases, such as cancer, result from specific body dysfunctions and cannot be transmitted.
- Human activities can enhance potential for hazards. Acquisition of resources, urban growth, and waste disposal can accelerate rates of natural change.
- Natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risk. Students should understand the costs and trade-offs of various hazards...

Overall it would seem that a typical high school life science teacher would have some difficulty covering food safety issues in depth—at least in terms of the simple messages that are currently being disseminated. However, moving away from the current focus on specific behaviors and continuing to treat the topic as an environmental concern—the risk of which can be greatly reduced through individual responsible behavior—may hold promise.

In addition, it is worth noting that some specified life science classes at the high school level may provide some additional opportunities, although fewer students take these courses. Advanced microbiology courses could potentially include in-depth coverage of the topic as there is currently good coverage of the topic in some texts. Also, lower level science classes will be more oriented to applications of science in daily living activities such as food preparation.

Instructional Materials for Science

In conducting a review of some science textbooks and teachers' guides, we discovered the following:

- Idea of the food web (i.e., producer-consumer-decomposer) is covered in virtually every science text and in the science standards, particularly for the middle grades.
- Older science texts tend to have very little coverage of food borne illness—at best a couple of passing references to food poisoning. Newer texts—those published after 1993—tend to have more coverage.
- For example, at the middle school level, the 1995 edition of *Science Interactions: Course I* from Glencoe/McGraw-Hill includes a reasonable treatment of microorganisms in food (e.g., What makes milk spoil?) in several pages of the chapter, "Viruses and Simple Organisms."

Newer high school biology texts also include coverage of the topic. At the high school level, McGraw-Hill's 1995 edition *The Nature of Life* includes a two-page spread, "DNA and a Deadly Repast," as the opening to a chapter on DNA. This story focuses on the 1993 *E. coli* O157 outbreak at Jack-in-the-Box restaurants. Similarly, in the 1995 edition of *Biology: The Unity and Diversity of Life* from Wadsworth Publishing, the text accompanying a large picture of *E. coli* O157 bacteria tells the story of the Jack-in-the-Box incident. Also, throughout this later edition, there are "Focus on Health" sections, one of which addresses botulism and the method by which bacterial toxins kill.

This can be contrasted with the 1992 edition of the text which contains a few explicit mentions—for example, related to transmission of disease and types of bacteria—but no focus or vignette on the topic of food-borne illness.

Recent higher level microbiology texts for high school seem to include a more extensive treatment of food borne illness and the microbes that cause it. For example, the 1995 edition of *Microbiology: An Introduction* from Benjamin/Cummings Publishing devotes approximately 10 pages to applied food microbiology.

2. HEALTH EDUCATION STANDARDS

Curriculum standards in health education have been developed by various groups. Depending upon the orientation of the group responsible, the standards may provide more or less guidance in terms of content, desired outcomes, instructional methods, assessment, and other areas that influence curriculum. The science standards are quite comprehensive and cover everything from content to professional development for science teachers. In contrast, the health education

standards developed by the Joint Committee on National Health Education Standards, provide little guidance in the way of content—presumably leaving specification of content up to State and local education agencies.

The health education curriculum standards were developed around the notion of “health literacy.” A health-literate person is a critical thinker and problem solver; a responsible, productive citizen; a self-directed learner; and an effective communicator. The health education standards, state that students will

- Comprehend concepts related to health promotion and disease prevention
- Demonstrate the ability to access valid health information about health-promoting products and services
- Demonstrate the ability to practice health-enhancing behaviors and reduce health risks
- Analyze the influence of culture, media, technology, and other factors on health
- Demonstrate the ability to use interpersonal communication skills to enhance health
- Demonstrate the ability to use goal-setting and decision-making skills to enhance health
- Demonstrate the ability to advocate for personal, family, and community health.

The focus of health education programs over the past decade has been on the reduction of a somewhat narrowly defined set of “risk behaviors”—tobacco use, use of alcohol and other drugs, dietary patterns, sedentary lifestyle, sexual behaviors that result in HIV infection/other Sexually transmitted diseases (STDs) and unintended pregnancy; and behaviors that result in intentional (e.g., suicide) and unintentional (e.g., auto accidents) injury. Nevertheless, there is no reason why food safety education could not fit into the framework of the Joint Committee of the National Health Education Standards.

The health education standards are designed to “help students achieve the health goals in *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*.” *Healthy People 2000* presents a national strategy for significantly improving the health of the American people in the decade preceding the year 2000. *Healthy People 2000* recognizes that lifestyle and environmental factors are major determinants in disease prevention and health promotion. It provides strategies to significantly reduce preventable death and disability, to enhance quality of life, and to reduce disparities in health status between various population groups within our society.

The *Healthy People 2000* objectives include Year 2000 Objectives for Youth, which have greatly influenced school health education programs—but these do not include any topic closely related to food-borne illnesses. Even “infection” seems to be limited to STDs and “nutrition” to dieting and not eating too much junk food. The food safety objectives in *Healthy People 2000* are not included in sections where educators are likely to search for them.

As the year 2000 draws near, Healthy People objectives are being revised. *Healthy People 2010* may include additional food safety objectives or objectives that are presented in such a way that they are adopted as a major school health education concern. The majority of the school health education content for both *Health People 2000* and *Healthy People 2010* seems to fall under the goal "Promote Healthy Behaviors," whereas the food and drug safety objectives fall under the goal "Protect Health." Specifically, food and drug safety is one of the 22 priority areas of *Healthy People 2000*, falling under health protection. The current Food Safety objectives are

- Reduce food-borne infections
- Reduce salmonella infection outbreaks
- Adopt model food codes
- Improve food-handling techniques.

A number of consumer-oriented messages have been developed. These include the four Fight BAC!™ food safety messages developed by USDA/FDA.

1. Clean: Wash hands and surfaces often
2. Separate: Don't cross contaminate
3. Cook to proper temperature
4. Chill: Refrigerate promptly

Yet despite the accessibility and practicality of these primary messages, a review of health education materials reveals that the topic of food safety has not made its way into school health education programs.

Instructional Materials for Health

In conducting a review of some health education textbooks and teachers' guides, we observed the following:

- *Healthy People 2000* appears to have had a major influence on health education materials over the past decade. As a consequence, these materials focus on the risk behaviors described above and pay very little attention to food safety issues.
- Even when the topic of infection is addressed, the idea of food borne illness is rarely covered. The 1991 edition of the low-level high school text *Your Health* from Benjamin/Cummings Publishing serves as an example. There is an entire chapter on infectious disease and the immune system, but the majority of the chapter is devoted to STDs. Although there is a brief treatment of bacteria and viruses, along with discussion of some common contagious diseases (e.g., influenza, measles), there is no mention of food-borne illness.
- Placement in the text, along with depth of treatment, gives some indication of the priority given to the topic of food safety. The 1991 edition of *Core Concepts in Health (High School Level)* from Mayfield Publishing devotes two pages to food safety and includes sections with

titles such as “The Food Supply: Is it Safe?” and “Tactics and Tips to Protect Yourself from Food Poisoning.” This coverage is embedded in the chapter “Nutrition: Facts and Fallacies,” rather than in the chapter that focuses on infectious disease, and the information is about two thirds of the way through the book—after mental illness, sex, and drugs. Given the priorities for school health education, it seems likely that the topic never gets covered, even by teachers using this text.

- Even newer texts pay scant attention to the topic. In Brown and Benchmark’s 1995 edition of *Decisions for Health*, each chapter begins with relevant *Healthy People 2000* objectives. However, despite the fact that there are food safety objectives, neither the chapter “Nutrition: Healthy Food Choices” nor the chapter “Communicable Diseases” cover food-borne illness. Again, the topics covered are common infections (e.g., colds and influenza) and less common disease (e.g., plague and hepatitis)—with a very heavy emphasis on STDs. The 1993 middle school text *Teen Health: Decisions for Healthy Living* from Glencoe/MacMillan/McGraw-Hill is similar. The coverage links to *Healthy People 2000* objectives, but does not include coverage of food safety objectives. Although there are two passing references to food poisoning, it is never defined, nor is it explained how a person contracts it or how one can avoid contracting it.

In some cases, the information, particularly in older texts may be erroneous. This is important because the textbooks in subjects such as health and family/consumer science are not replaced as often as those for academic subjects. As a result, it is common to have older textbooks in use in these subjects. One glaring example of this is in the 1990 edition of *Being Healthy* from Harcourt-Brace-Jovanovich. On the positive side, this textbook contains more than usual amount of information about microbes and infections. But it also contains some very misleading information such as the statement, “In the past, milk, meat, and other foods often carried harmful microbes. Now in communities throughout the United States, workers in restaurants and factories must prepare food in ways that keep it free from harmful microbes.” The implied message is: We don’t have this problem anymore. Furthermore, it assumes that preparation regulations are always followed.

Some materials do include information on personal habits that are helpful in preventing food-borne illness, such as handwashing. Although food borne illness may never be addressed, learning proper handwashing techniques should lead to reduced incidence of food-borne illness.

3. FAMILY AND CONSUMER SCIENCE CURRICULUM STANDARDS

Family/consumer science is battling for its share of the student enrollment and, in response, many programs are revamping to make them more relevant for today’s student. Typically, five major areas are covered: foods and nutrition; human growth and development; management and consumerism; housing, furnishings, and equipment; and textiles and clothing. This topic clearly fits best in the foods and nutrition portion. This module is typically addressed at middle and high school grade levels (6 through 12).

The standards for family and consumer sciences now under development are nutrition, food safety, and wellness, so that students can “evaluate nutritional, food safety, and wellness

practices to promote individual and family well-being across the life span.” Under this overall standard, there are content standards to

- Evaluate the factors affecting food safety from production through marketing
- Analyze food-borne illness as a health issue for individuals and families
- Demonstrate safe consumer practices for handling food to reduce the incidence of food-borne illness for individuals and families
- Analyze information on product labels that have food safety implication for individuals and families
- Evaluate the impact of science and technology on food composition and safety, nutrition, and wellness of individuals and families
- Contribute to the public dialogue about food safety and sanitation.

Clearly, these standards—as well as the overall philosophy of family/consumer science—make this an ideal venue for providing food safety instruction.

Instructional Materials for Family and Consumer Science

In conducting a review of some family/consumer science education textbooks and teachers’ guides, we observed the following:

- Family/consumer science textbooks published in the past decade provide fairly extensive coverage of food safety issues. For example, the 1990 edition of the middle school text *Young Living* from Glencoe Publishing includes a lesson, “Food Safety and Sanitation.” Approximately four pages in the text are devoted to the topic. The lesson includes the basic food safety messages with lots of specific how-to information, such as how to wash dishes and how to clean up the kitchen to prevent cross contamination.
- The “*Danger Zone*” concept is incorporated into many texts published over the past 2 decades. The 1988 edition of *Guide to Good Food* published by The Goodheart-Willcox Company integrates *The Danger Zone* concept into its eight pages of coverage on sanitation. Specific topics addressed are “Food-borne [sic] Illness Microorganisms,” “Personal Hygiene,” “Kitchen Cleanliness,” “Sanitation in Food Preparation and Storage,” and “Cooking for Crowds.” And even older texts, such as the 1980 edition of *Exploring Foods* from Prentice-Hall include *The Danger Zone* concept. In this case, about 12 pages of the text are devoted to the topics “Food Spoilage and Food Poisoning” and “Keeping Food Safe to Eat.”

While food safety is incorporated into earlier texts, the concepts and messages are somewhat different than in more recent publications. For example, the 1974 edition of *Focus on Food* from McGraw-Hill Book Company provided information on food-borne illness and the organisms that

cause it, but the messages on prevention are not as clear, focused, and precise as those in current textbooks.

4. FROM NATIONAL LEVEL TO CLASSROOM

Curriculum standards are developed at a national level. Most textbooks are developed by publishers who—for economic reasons—try to accommodate the largest possible number of school districts. While standards and textbooks may be carefully and thoughtfully laid out, there are four very important levels at which there can be slight or significant deviation from the ideal envisioned at a national level:

- State level curriculum frameworks and mandates
- District level curriculum guidelines
- Building level and departmental decisions
- Individual teacher preferences.

When the national standards movement began in 1983 with the initiative to set a national mathematics standard, the initiative seemed straightforward. “Experts in various disciplines would develop national standards for what students should know and be able to do at key points in their schooling; a Federal council of distinguished citizens would review and certify the standards as worthy of emulation; States and school districts would voluntarily adopt them; teachers would teach to them; and students would achieve them.”² But it is not simple and the national standards have fallen prey to criticism and concern at a national level and to resistance at the state and local levels. In some cases, this resistance is reinforced by State law, which in turn has a powerful influence on what is actually taught in the classroom.

To illustrate the point, Macro obtained a copy of the Standards of Learning for Virginia Public Schools and a copy of the current program of studies for a Virginia middle school. A comparison of one with the other and to the national curriculum standards for science³ indicates that the State standards do not include the personal and social perspectives on science that is included in the national standards. These perspectives are important because national standards related to this personal and social perspective provided many of the objectives to which food safety education can easily be linked in the science classroom. There are still some opportunities, however, within the Virginia standards to provide food safety instruction. There is a good bit of emphasis across the upper elementary grades and in middle school life science on the dynamic interrelationships between life forms and, in particular, on food webs (producer-consumer-decomposer). In addition, the Virginia biology standards include a number of objectives that are likely to provide some opportunities for instruction related to food safety, including those on causative agents of disease, human health issues, and cells and single-cell organisms.

Going to the school and district levels, we discovered that some of the middle school life science courses described in a curriculum guide corresponded only loosely to the State standards. The

² Special Report, *Education Week*, April 12, 1995, Vol. XIV, No. 29.

³ The Standards of Learning for Virginia only cover the academic subjects: Mathematics, science, English, and history/social science.

organizing feature of sixth-grade science is "The Voyage of the Mimi," a well regarded curriculum package that includes a print story/adventure guide, videos, hands-on activities, and extensive use of computer simulations. The seventh-grade life science course comes much closer to alignment with the State and the national standards.

Even with the pressures for accountability on schools today, when a teacher closes the classroom door, the teacher truly is in control of that class; the teacher controls the topics covered and the instructional methods employed—regardless of any mandates from above or resources that are available. For example, one middle school science teacher with whom we spoke had a text that included some coverage of food safety, as well as some additional resources that included food safety education activities. Yet she had never taught her students anything about food safety and was, in fact, not even aware that the text covered the topic. She was open, however, to the idea of including some coverage of the topic.

The following sections include a summary of the interviews conducted by Macro with teachers and other school-based professionals, as well as those individuals representing standards-setting organizations, and instructional materials developers.

C. Food Safety Education Materials

Food Safety Education Materials—A significant number of supplementary curriculum materials have been developed to support instruction on food safety. Some of these are intended for public school students of various ages. Others are considered by their developers to be easily adaptable for use in K-12 classrooms. Macro reviewed 51 products and spoke with eight individuals who had been involved in the development of food safety education materials to ascertain the overall quality and usability of the materials in public education. Appendix C is a matrix that provides information about the reviewed products.

Since 1990, a significant number of supplementary curriculum materials have been developed to support instruction on food safety. Some of these are intended for public school students of various ages. Others are considered by their developers to be easily adaptable for use in K-12 classrooms. Macro conducted a review of these materials. We obtained descriptions of 51 products.⁴ For 22 of these products, project staff reviewed the materials to ascertain the overall quality and usability of the materials in public education. We also spoke with eight individuals who had been involved in the development of food safety education materials. Those interviewed were:

⁴ Most descriptions are based primarily on the description of the product in the USDA/FDA Food Borne Illness Education Information Center database.

Lynn Brown	Pennsylvania State University
Phyllis Dennee	Montana State University
Pat Hammerschmidt	Michigan State University
April Mason	Purdue University
Matrid Ndife	Ohio State University
Lori Pivarnik	University of Rhode Island
Barbara Selover/Pat Fuchs	National Cattlemen's Beef Association
Peggy Sherry	Iowa State University

Appendix C is a matrix that provides information about the products on which we obtained information. The matrix includes

- Product name
- Date of publication
- Author/developer name
- Media/format
- Target audience
- Content coverage/organization.

For the products that we were able to examine, we have also included some—admittedly subjective—comments regarding the potential value of the product. The analysis that follows is based on product descriptions, informal product reviews, and our conversations with developers.

I. PRODUCT OVERVIEW:

Developers and Funding

A number of the food safety education materials have been developed by the agricultural extension offices and food science departments at land-grant universities throughout the United States. Many of these appear to have been funded through various grant programs sponsored by USDA. Examples of extension products are *Bacterial Contamination of Foods*, *Chances and Choices with Food*, *Creating Informed Citizens For Tomorrow's Food Safety Decisions*, *Discovering Food Safety: Detective Mike Robe's Fantastic Journey*, *Don't Get Bugged by a Food Borne Illness*, *Germ Squirm: Kids and Safe Food Handling*, *Getting a Jump on Germs: Making Food Safer*, *Mystery of the Poisoned Panther Picnic*, *Operation Risk*, *Producer Through Consumer: Partners to a Safe Food Supply*, *Project Food Safety: Educational Units for the Middle Level Science Classroom*, and *Tosha's Day*.

Some materials appear to have been developed by partnerships involving USDA/FDA and various food-oriented associations such as the Chef and Child Foundation, the Partnership for Food Safety Education, and the Food Marketing Institute. Products in this group include *Fight BAC!™*, *Food Risks: Perception vs. Reality*, *Food Safety at Home, School, and When Eating*

Out, Play it Safe: Goals for Food Safety; and *Serve It Safe: A Manager's Tool Kit*. USDA/FDA independently produced *The Danger Zone*, and *Food Safety is No Mystery*.

The trade organizations for some food groups such as the American Egg Board and the National Cattlemen's Beef Association have also developed food safety education materials. Products developed by these groups include *Adventures with Mighty Egg*, *Incredible Journey from Hen to Home*, and *Safe Food Journey*.

Finally, there are some private for-profit firms that have developed food safety education materials. In some cases development seems to have been self-funded. In others, it appears that they have received some support either from the Federal Government or other sources (e.g., Kellogg Foundation). This product group includes *Food Safety Can Be Fun*, *Glitter Bug*, *Glo-Germ*, *Introduction to Kitchen Safety: Disasters Waiting to Happen*; *Wash Those Hands!*, and *Wash Your Hands*.

Media and Formats

Materials are currently available in a wide array of media and formats. Most common is some type of curriculum guide. These guides vary a great deal in terms of both depth and breadth of coverage. However, they typically include background information on food safety for educators, lesson plans, teaching materials (e.g., overheads), and students handouts. In some cases, there may be handouts for parents or tests for students. Other print materials used for food safety education include brochures, posters, storybooks, and coloring books.

There are a number of products that include a handwashing activity. These generally involve use of some compound that grows under certain kinds of light and that requires thorough washing to remove. This may be a stand-alone product or may be incorporated into a broader curriculum on food safety.

Videotapes are also commonly used to provide food safety education and training. Some—for adult audiences—take a fairly straight forward approach. However, most tapes that are intended for school use employ some kind of a problem-solving or mystery approach. Tapes of this kind include: *The Danger Zone*, *Discovering Food Safety: Mike Robe's Fantastic Journey*; *Food Safety is No Mystery*, *Mystery of the Poisoned Panther Picnic*, *Operation Risk*, and *The Rockin' Handwashing' Report*. There are also some slide/script packages and a few audiotapes—most notably two rap songs, “Path-O-Gens Are on Your Path” and “Handwashing Rap.”

There are several computer applications—including at least one multimedia application—to teach food safety. These applications include *Let's Have a Killer Cookout—NOT!*, *The Food Safety Zone*, and *Risk Raiders*. The last two are included in a larger curriculum package.

Many products extend the reach of their message through the use of parent handouts. A few actually include some public relations materials such as factsheets, press releases, and public service announcements. Products with such materials include *Don't Get Caught Dirty Handed*, from CDC, and *Fight BAC!*^[TM], from the Partnership for Food Safety Education.

The above summary describes the range of media in which food safety education materials have been developed. However, it is important to state that they are packaged in all kinds of

combinations. Some materials may include only one or two items—for example, a print curriculum guide, videotape, or game. Others bring together a number of media and formats, usually in an effort to deliver a structured and comprehensive food safety curriculum. Examples of such multiple media curricula are *Bacterial Contamination of Foods*, *Creating Informed Citizens for Tomorrow's Food Safety Decisions*, *The Danger Zone*; *Discovering Food Safety: Mike Robe's Fantastic Journey*, *Food Safety Can Be Fun*, *Food Safety Express: Food Safety for Preschool Children*, *Food Safety is No Mystery*, *Mystery of the Poisoned Panther Picnic*, *Operation Risk*, *Producer Through Consumer: Partners to a Safe Food Supply*, and *Serve It Safe: A Manager's Tool Kit*. Some of these curricula incorporate or reference materials that have been developed by others. This use is particularly true of curriculum packages developed by the extension service offices. Those curricula that do not include all of the components in the package provide a description of the product and information on how to obtain it.

Target Audiences

Some materials have been developed for virtually every target audience—from Head Start preschoolers to food service professionals. The materials available have four primary target audiences:

- Consumers
- Students—preschool through high school
- Entry level food service workers
- Food service professionals.

Many materials specify more than one target audience. For example, materials for entry level food service workers are often considered to have middle or high school students as a secondary audience. Examples of this are *Diner Detective*, *Food Safety is No Mystery*, and *Wash Your Hands*.

There is more than one product for every age student. Most specify an age or grade range as the intended target audience. Products for preschoolers include *Discovering Food Safety: Mike Robe's Fantastic Journey*, *Food Safety Express: Food Safety Education for Preschool Children*, and *Tosha's Day*. For early elementary school, available products include *Adventures with Mighty Egg*; *Food Safety at Home, School, and When Eating Out*; and *Growing Healthy: Coming to Terms with Germs, Germs from A to Z*.

There is a wealth of materials for upper elementary school and middle school including *Chances and Choices with Food*; *Creating Informed Citizens for Tomorrow's Food Safety Decision*; *Get a Jump on Germs: Making Food Safer*; *Growing Healthy: Coming to Terms with Germs, Germ Terminators*; *Incredible Journey from Hen to Home*; *Kitchen Safety Game*; *Let's Have a Killer Cookout-NOT*; *Mystery of the Poisoned Panther Picnic*; *Operation Risk*; *Play It Safe: Goals for Food Safety*; *Producer Through Consumer: Partners to a Safe Food Supply*; *Project Food Safety: Educational Units for The Middle Level Science Classroom*; and *The Rockin' Handwashin' Report*.

Many of the materials useful at the middle school level could also be used in high school. The only product that is specifically for high school use appears to be *Food Risks: Perception vs.*

Reality. However, some that are intended to be used as training for entry level food service workers such as *Diner Detective* and *Food Safety is No Mystery* can also be used with high school students, particularly those in vocational foods programs.

While products developed to date cover all school grades, they do not necessarily meet the needs of all students. There are relatively few products for individuals with special educational needs such as low-literacy skills or physical or cognitive disabilities. There are also few materials for those with limited English proficiency.

Curriculum Linkages

The materials developed take a variety of approaches, depending upon the age of the children for whom they are intended and the subject(s) in which the developer envisioned the product being used. Those intended for young children tend to have an interdisciplinary orientation, which is appropriate for preschool and primary classrooms. For example, *Adventures with Mighty Egg* integrates math, science, language arts, and art activities in teaching children all about eggs.

There are few materials that are for use only in the upper elementary grades—that is grades 3 through 5. Two that are focused on this level—*Incredible Journey From Hen to Home* and *Operation Risk*—tend to be somewhat interdisciplinary and to focus on problem solving as the primary instructional activity.

Many materials cover some upper elementary grades as well as middle grades. Most of the materials intended for this age group seem to be intended for use in either the family/consumer science classroom or the science classroom—science being the more common. There are a few materials that try to accommodate use in more than one subject. Among these are *Bacterial Contamination of Foods*, *Creating Informed Citizens for Tomorrow's Food Safety Decisions*, and *The Danger Zone*.

At least one program at the high school level—*Food Risks: Perception vs. Reality*—also takes this multiple subject approach and includes references to general science, biology, and chemistry textbooks, as well as to family/consumer science and health texts. Virtually all of the other programs for high school students seem to be intended for use in either a family/consumer science or vocational foods class.

Content Coverage and Organization

The majority of the products focus exclusively on food safety from the standpoint of microbial contamination. A few incorporated food safety issues such as additives and pesticides. For example *Project Food Safety: Educational Units for the Middle Level Science Classroom* focuses on microbial contamination in sixth grade, pesticides in seventh grade, and irradiation in eighth grade.

Most products—regardless of target audience—take a fairly comprehensive view of the subject and deliver the equivalent of the four food safety messages now being disseminated in the *Fight BAC!*TM campaign. A few products—primarily those for very young children and for use in training entry level food service workers—are focused on development of a particular habit or skill, usually handwashing.

Some products developed by groups with an interest in a particular type of food product such as eggs or meat teach about all aspects of the food and include discussion of food safety in the overall unit. Finally, a few products integrate microbial contamination of food into a broader treatment of kitchen safety which includes topics such as using knives, preventing shocks and fires, and handling kitchen emergencies.

Quality and Usability

In beginning this discussion, we pointed out that the materials have been developed with various target audiences in mind—consumer, students in preschool through grade 12, entry level food service workers, and food service professionals. Having reviewed these products, we believe that some materials in each of the first three categories may be very usable as instructional materials for K-12 education.

An impediment to their use up to this point is that they are not adequately publicized to educators and in some cases may be difficult to obtain. None of the teachers interviewed was aware of the range of products that have been developed. This is not to say that every product should be aggressively marketed to educators as there is a considerable range in the quality of the products that have been developed. However, some are quite good and could be a valuable instructional tool for teachers interested in teaching students about food safety.

Most schools now have the resources to use all of the products that have been developed. VCRs and television sets are commonplace in virtually every school. Computer availability is increasing rapidly—including access to those with multimedia capabilities and/or access to the Internet. There is nothing that has been developed that is “ahead of the curve” in terms of technology access. The issue is not whether the technology exists, but rather how to we give teachers the motivation to obtain the materials and integrate them into their instructional programs.

2. DEVELOPER EXPERIENCES

In speaking with developers about food safety education, we probed for their general views on and experiences with food safety education in kindergarten through grade 12. The following is a summary of those interviews in the words of the developers with whom we spoke.

Interest in food safety has increased in the past few years.

- It's increased both for children and adults. Part of it is the media picking up everything related to food safety. They're really overhyping the risks but it does draw attention to the topic.
- It has really grown. The media has done some of that. On the negative side, some of it has been done as a scare tactic. The plus is that people have become more aware—even if their behavior is not changing that much.
- Without a doubt, it is a higher priority. The general consumer is well aware of food safety issues—even if they don't practice safe food behaviors.

- Awareness has definitely increased—because of the media attention.
- We surveyed teachers via a teacher newsletter and asked them to check off the topics that would be of most interest to them as teaching units. The list included things like additives, biotechnology, pesticides, and bacterial contamination. Bacterial contamination was the most often named.
- Awareness has gone up. But there is sort of a dichotomy. It's the highest it's been. So now we know, but we still don't change our behavior. We know so much about food safety, but we leave things out on the counter, don't wash our hands. We know we're supposed to but we don't. Awareness is raised, but behavior hasn't changed.

Students are receptive to learning about food safety.

- The students were fascinated. The lessons involved problem solving, case studies, group work, and labs. The lessons applied to real life and that really engaged children.
- Children are eager to learn about food. We can tap into this eagerness to learn.
- Adults must introduce the topic but children are very receptive—especially if you present the topic in ways that children learn best.

It's never too early to start teaching children about food safety.

- You can do some work with children as young as kindergarten. Children can learn sanitary practices, where food comes from, and how to make it safe.
- The younger the better. Third grade is not too early, although we need to be attuned to what they are ready to learn and make sure the instruction is developmentally appropriate. Even three and four is not too early for some simple messages like handwashing.
- Third to fifth graders are definitely receptive. It's a good age for [learning about food safety.]
- We believe that third to fifth grade is a good time to try to reach children with food safety messages.
- We are refining some lessons. We're adding a lesson on personal hygiene and handwashing for younger children who are not really involved in food preparation. Subjects like cross contamination are more relevant for high school students.
- It's important to keep it [food safety] in front of students at all grade levels.
- We need to find a way to reinforce the messages. People see it [reports of food-borne illness] in the headlines, but they go back to their usual behaviors. We have to find a way to make it stick.

Food safety is really a science topic.

- To get it into the mainstream, you need to get it into science classes.
- It's a science topic—even if it's taught in health or family/consumer science class.
- Food safety can be very valuable in making science practical and concrete. Children can relate to this.
- It should be in a class that everybody takes. Fewer and fewer students are taking family/consumer science. I'd like to see it in the science classroom and make the microbiology connection.
- Middle school science probably also offers good opportunities for food safety instruction.
- We developed our materials primarily for the science classroom, but made them friendly for use by family/consumer science or health teachers. The unit can be team taught, and when we implemented it, this did happen. In most middle schools there are some attempts to do interdisciplinary units and projects.
- It may be possible to interest science teachers, but it will take something snazzy about food safety and microbiology to get them to adopt.

Although it's an ideal setting to provide food safety education, most students don't take family/consumer science.

- Most States do not require family/consumer science at any grade level.
- Fewer and fewer students are taking family/consumer science.
- Family/consumer science is the best place, but you can't reach enough students.
- Family/consumer science would be a good venue if it were "alive and well"—but in my State it's not.

Health class offers limited opportunities for food safety education.

- A separate health class is mandated in middle school only. The rest of the time the health instruction is incorporated into other subjects.
- Health teachers focus on risk behaviors. Coverage on general health issues and nutrition is perfunctory.
- I don't want to see food safety education punted off to health.

Most materials have incorporated the USDA/FDA food safety messages.

- Food Safety—it's the same information. It's just the spin you put on it.
- The messages we deliver are the same year after year. It's just the presentation that varies.
- Materials exist. *Fight BAC!*TM is out there. Every State has benefited from USDA/FDA's food safety initiatives.
- We used the basic messages of Partnership for Food Safety —the *Fight BAC!*TM messages.
- Our materials emphasize the consumer's role in food safety—even children have responsibility. Time, temperature, and cleanliness—these are emphasized throughout.
- Materials must fit in with what teachers are already doing—and that means understanding what their mandates are.
- We need to associate and integrate this content into the existing curriculum so that it is not an add on.
- Materials that don't ask teachers to do more, but enhance what they were already doing, are more likely to be accepted.
- Teachers are so tied up, that unless you can give them materials that fulfill some of the existing mandates they will not be able to fit food safety instruction in.
- It may be possible to introduce some new content—that is particular food safety messages—as long as they meet the same instructional objectives.
- One problem in my state has been that the curriculum guidelines keep changing with political changes. That makes it difficult to try to develop materials and units that align well. It may be better to try to go with national standards.
- We need to look at what's out there in commercial textbooks. We need to make extension materials compatible with texts and national standards.

Hands-on learning opportunities are very important in food safety education.

- Good products will involve hands-on work—problem solving, case studies, group work and labs.
- It's important to provide hands-on activities like growing microbes and using glo-germ.
- It makes a difference if you present the topic in ways that children learn best—with exploratory and hands-on activities.

- I had to learn the hard way to break things down into smaller units. Children this age like hands-on experience—like glow stuff for teaching handwashing.

It's a serious subject, but learning about food safety should be fun.

- Some years ago, I produced a food safety video that was “just the facts.” It was a good, professionally done tape, but it doesn’t get used. It’s not something that people want to turn on and watch. Even the extension educators don’t like it, so they don’t use it.
- What guided us was if it could be translated into something that would interest students. If it’s too dry, it won’t get used.
- Children like gross stuff—like the scene about the restaurant kitchen in the video—especially the boys.
- Make it fun!

Teachers need training if we expect them to teach about food safety, but they are a hard audience to reach.

- Almost everyone will need some training. There is so much misinformation out there—even among family/consumer science teachers. But it’s hard to get teachers to come for training, so we need to entice them.
- You won’t get a lot of teachers picking this up unless you give them some training. Teachers will be more willing to do a unit on food safety if they’ve had inservice training. The problem is finding a way to get on the inservice schedule or otherwise attract teachers to do it on their own time. It’s hard to get teachers’ attention.
- Elementary school teachers are afraid of science, so it’s hard to get any kind of science instruction implemented at the elementary school level.
- Training videos can be very useful in getting teachers to adopt new materials. You can show the video and say, “See, you can do this too.”
- In our most recent training teleconference we produced some video roll-in segments with Ken McCan, the Food Safety Man. He is our “expert” on the topic of food safety. These segments are very useful as roll-in segments in the teleconference, but they also have had a whole other life after the broadcast. We get lots of requests for the tape.

Try to get teachers involved in the development process.

- Getting teachers involved helps ensure that the materials are user friendly and age appropriate.
- It helps if you can get teachers involved in development. Then, they take ownership. Teachers want to use what other teachers have been involved in. The problem is that it is

really hard to get them involved because they're so busy. There are just so many demands on teachers.

Getting the word out about available food safety education materials is important.

- There are some good materials that extension has put together, but they're not promoted and marketed the way textbook publishers market their products. We need to make them [extension materials] appealing and user-friendly—and get the word out about them to teachers.
- We didn't build in enough marketing. We probably should have put more money into marketing and should have promoted it a lot more. Extension publications is the sole distributor for it.
- We turned the National Cattleman's Association's poster over to the State beef councils. The councils have distributed it widely including in unexpected places like WIC clinics and grocery stores. Grocery stores provide the poster to school tour groups when they visit the store. So far, about 200,000 copies of the poster have been printed and most have been distributed.

School nurses and food service personnel will play a supporting role in food safety education.

- School nurses have shown some interest in using the materials. The problem is that there are not very many of them in my State.
- School food service staff could be a link, a resource for teachers. For example, teachers might have their classes visit the cafeteria to demonstrate safe food handling practices. But there is no expectation that their role is to teach students. So you can't expect cafeteria supervisors to assume a leadership role.
- There is also a lot of talk about food service workers' being involved in Team Nutrition, but the hierarchy in schools may limit the degree to which this can occur. Posters in the cafeteria and instruction in the classroom makes sense. In any case, it will depend on collaboration between the cafeteria supervisor and classroom teachers. Sometimes it will work and sometimes it won't depending on the personalities and priorities of those involved.
- There is always a problem getting children to retain classroom instruction. Cafeteria posters and bulletin boards would be good as follow-up to help with behavior change.

New media can help get the message across.

- Videotapes are great. And I love software. If there could be more software, that would be great.
- Children like CD-ROM applications, and team learning around the use of a CD-ROM might be a good idea.

- The software in our curriculum hasn't been used quite as much as other program components—maybe because of equipment access—but I would like to update it and put it on CD.
- Interactive Web sites would be great. A lot a schools in my State are hooked in. There's a lack there.
- Children and teachers love our Web site generally. Students especially really like the delivery method. The response has been phenomenal. We've had 3,300 visitors in just 3 months.
- You need to keep a Web site alive. We now have food safety headlines on our Iowa State University Web site that change every day. Today we have 15 food safety articles from around the world. Posting the headlines every day is a way to keep the site living and breathing.
- Before we did our last product, we did some research and concluded that to get into schools, the best formats would be print materials and video kits. We continue to monitor growth of technology use in schools and we are looking seriously at education via the Web. Currently we're planning a Web site for upper elementary and middle school students.

D. Interviews

Interviews—Interviews with teachers, school health service, and school food service personnel revealed that awareness of food safety issues is high among the individuals interviewed for this study, with the media being the main source of information on the subject. Interviewees all agreed that food safety is an important topic for students to study, but they also confess that little is covered in existing curricula so it is not a priority issue at the present moment. Much of what is currently being taught about food safety in the schools is covered in family and consumer science courses, with middle school students focused mainly on life skills, and the higher grades concentrating more on vocational training.

While educators feel that there is a lack of high-quality educational materials relating to food safety, the materials that do exist come in a variety of formats. Interviewees listed the following as media types that they currently make use of in teaching students about food safety: videos, movies, standard science text books, newspapers, television news reports, the Internet, Governmental materials and campaigns (e.g., Fight BAC!™, and The Danger Zone), magazines (e.g., Science World), "current events," posters, radio news broadcasts. Interview participants discussed the need for activities to be hands on in order to maintain interest in the topic and to engage the students in the lesson.

Informants mentioned a wide variety of activities that students really enjoyed. Most agreed that students liked to participate in hands-on activities and that they wanted to be challenged in a variety of ways. All of the interviewees stated that computers were available in their schools, and all were interested in how they could make better use of the technology to deliver food safety and other educational messages. Most of the interviewees agreed that students were interested in their own health and that for the most part students today were interested in taking steps to take care of themselves. This, they agreed, meant that food safety was likely to be well received by students.

Nearly everyone interviewed agreed that middle school grades were the most appropriate place for the food safety messages. While many interviewees agreed that food safety messages could be tailored to any age, grades six through eight were nearly unanimous suggestions as "giving the best bang for the buck." Most of the teachers and organizational representatives interviewed thought that food service and health services staff could have a limited role in delivering a food safety message to students. The school health services and food services staff who participated in the interviews agreed that they could play an important role, albeit backseat to teachers, in delivering the food safety message.

Teacher- and Standard-Setting Organization Interviews

How Can Awareness of Food Safety Increase?

Awareness of food safety issues was high among the individuals interviewed for this study. Most cited the media as their source of information on the subject. Newspapers, magazines, television, radio, and the Internet were frequently mentioned as sources of information. Many of the teachers interviewed said that this heightened awareness was put to use in the classroom. "I often will hear something in the news and then discuss it with my students that day in class. I try to fit current events into their lessons," one family and consumer science teacher stated. Jack in the Box and the Hudson Foods incidences were mentioned often as events that created awareness for interviewees. "We are in Jack in the Box country, so people take food safety very seriously here," one food service director stated. Textbooks were also mentioned as sources of information on food safety. One family and consumer science organizational representative

explained that he wrote a textbook on food safety in 1982 for McGraw Hill, as part of a series for occupational home economics. At that time he never imagined that there would ever be a need to educate all children on food safety issues. After contracting *E. coli* O157 last year, his position changed. "You know, we all have to be careful," he stated.

Public health departments were also mentioned as a source of information and a catalyst of increased awareness for food safety messages. Several health services and food services personnel stated that the health departments in their areas printed posters on nutrition and safety, and that some of these materials included food safety items. Several interviewees explained that they themselves had been victims of food-borne illnesses in the past, several quite recently. Salmonella and *E. coli* were two illnesses that were mentioned. These bouts with food-borne illnesses are an unfortunate means of raising awareness of food safety issues.

What Priority Is Given to Food Safety Education?

Interviewees all agreed that food safety is an important topic for students to study, but they also confess that little is covered in existing curricula. One family and consumer science teacher explained that while not much time is currently devoted to food safety, a week on food safety is allotted in the curriculum guide used by the district. A science teacher said that science curricula are already crowded, mostly because of school district and State mandates for learning objectives. A family and consumer science teacher stated that of all home economics teachers in the county that she knows, very few (about 12 teachers) place a high priority on food safety education. She said it was difficult to determine just how much time was spent on food safety since the topic was not part of a stand alone "subject block." One health teacher stated that, "on the surface, food safety is not the most exciting topic." She suggested an ongoing social marketing effort to promote the subject matter. School food service personnel agree that the topic is of the utmost importance, but that little attention is given to it in schools.

What Is Being Taught About Food Safety?

Much of what is currently being taught about food safety in the schools is covered in family and consumer science courses. Education in this area for middle school students focuses mainly on life skills, while at the higher grades it is more vocationally focused. Typical subjects that are covered include food-borne illnesses (e.g., salmonella, botulism, and *E. coli* O157); sanitation techniques; keeping hot foods hot, cold foods cold; and *The Danger Zone*. It is common for students to learn about one type of food (e.g., eggs) per week in a home economics course. During that week she talks about eggs; then food safety for eggs is covered. One family and consumer science teacher explained that her courses in food sanitation were required for high school vocational foods students. In middle school, students have a foods unit for 3 to 4 weeks. These classes cover equipment use, ingredient measurement, kitchen safety, and sanitation (including washing, washing counters storing leftovers, thawing, making sure to use soap).

Several teachers and food service personnel described that the use of *GloGerm* was an effective way to teach about the importance of washing hands. One teacher stated that for the elementary schools in her district, representatives of the local university visit classrooms to teach elementary school students about handwashing by using this system which uses ultraviolet light to show students the germs on their hands. Several other teachers also discussed the benefits of handwashing and personal hygiene. One elementary school science teacher has her students use

antibacterial soap and a "germ passing" exercise "to really bring the lesson home." But she noted the importance of providing time during the school day to reinforce the handwashing message. By establishing a handwashing time (e.g., before lunch) students (and teachers) can form good hygiene and safety habits.

Several teachers and health staff cited personal responsibility for health and safety as a priority in teaching about food safety in general for students and for school staff. "Food safety is a major issue in the district, but it is primarily aimed at school staff, not students. We do encourage students to come for advice and to bring any food safety problems to our attention. For example, if the milk is not cold, or there are some sort of foreign objects in their food, they should bring that to our attention. We try very hard to practice good kitchen safety, especially with our staff." Many districts post food safety messages with their weekly printing of the hot lunch menus for the week. General safety procedures for working in the kitchen were also mentioned by several teachers as an area where food safety is covered.

Several science teachers discussed how they would like to link food safety more closely with units on microbiology, in an effort to make microbiology "more real for students." He stated that in addition to teaching about common food borne illnesses such as *E. coli*, he would like to include teaching about botulism and salmonella in such a unit. Science seems to be a good fit for the food-borne illness message. When one science teacher does a unit on bacteria, he currently covers food-borne illness. He works food safety into other science lessons as well. When he teaches a unit on worms, he talks about transmission of trichinosis from pork. He has talked about *E. coli* whenever there is a newsworthy outbreak. Part for these lessons involve discussing the variety of ways that the meat could have gotten contaminated (i.e., routes of transmission) in these events.

Instructional Materials: What I Have Used and Would Like To Use

While educators feel that there is a lack of high-quality educational materials relating to food safety, the materials that do exist come in a variety of formats. Interviewees listed the following as media types that they currently make use of in teaching students about food safety: videos, movies, standard science text books, newspapers, television news reports, the Internet, Governmental materials and campaigns (e.g., *Fight BAC!*TM, and *The Danger Zone*), magazines (e.g., *Science World*), "current events," posters, radio news broadcasts. Many interviewees stated that they located and secured these materials in local libraries, at State educational extension services, from commercial vendors (via educational catalogs or direct from wholesale producers), or by watching and videotaping local news programs at home on their personal machines. Several teachers and food service personnel also stated that they made their own materials when needed. One food service worker explained that her staff served as the information source for students' questions regarding food safety. "We don't have any materials per se. Usually a student will alert a food service person to a problem. There are some food safety posters in the kitchen, but they are primarily geared for staff. Students can see these posters when they tour the kitchen or go through the hot lunch line. Also, students can interact with the staff when they are in line. That is when they can ask questions and report problems." Food service staff are often used as materials for teachers, serving as experts on food and kitchen safety issues during classroom visits. "Each semester I go to the first and second-grade classes to do a talk with them about hot lunch and proper nutrition." Family and consumer science staff



often team up with food services staff to deliver food safety messages by using the school's kitchen or cafeteria as a teaching material itself. Tours of the kitchen facilities are very popular with students on family and consumer science teachers stated. "I have students from the high school home economics classes come to the kitchen," one district food service manager explained.

Several instructors and other school staff indicated that they currently do not use any materials when discussing food safety with students. When asked to describe what materials they would find useful, however, many suggestions were offered. "It would be great if USDA/FDA would put out a small video to cover the major topics, and maybe include things like handwashing, cross-contamination, and what to look for when buying food especially in restaurants," one representative of a family and consumer science organization stated. Other ideas included the development of a CD-ROM on food safety, an Internet Web site on food safety, and addition of food safety information to traditional textbooks. One health educator stated, "Instead of trying to initiate a standard curriculum, it might be a good strategy to go back to book publishers and get them to include information on food safety. Then it will be taught. It's a slower approach, but could be very successful. Once you get the material out there in the textbooks, it stays out there for a long time." Although she said she does not go page by page through any textbook, she claimed that if a message was in the text, she was more likely to cover it. Teachers are interested in using innovative but proven materials for delivering information to students. One elementary science teacher said, "We're going to do what is most effective and efficient." If instructional materials are available that help teachers be both effective and efficient, they will be used. We do not fool with what has not been proven. We're as old fashioned as using flashcards and as innovative as using the Internet. We use what works." Many teachers stressed the need for materials to be interdisciplinary—incorporating reading, writing, and calculating into lessons. Teachers are also interested in materials that tap into students' multiple learning styles. Hands-on activities, guest speakers, computer applications, and field trips were all mentioned as possibilities for activities that offered multiple learning styles for educational messages.

Regardless of the subject area(s) chosen for food safety education, interviewees thought that good materials and links to curriculum would facilitate teachers' integrating the food safety message into existing curricula and activities. Several teachers stated that if USDA/FDA were interested in introducing food safety instruction into the schools, the agency would need to provide high-quality materials. Any curriculum proposed should be flexible, allowing a teacher to pick and choose activities rather than being obligated to follow a long series of tasks and objectives. One high school science teacher stated that she would like to pick and choose those elements of a curriculum that has a natural tie-in with the subject matter that she is currently teaching. She stated that to date she had not seen many materials that would be useful to her in teaching her students about food safety. A middle school science teacher noted that his students like lessons and activities that were fairly structured at the core and that include related activities that were primarily open ended.

One elementary science teacher described what she thought would be a good product for teaching food safety to young children: "Develop and distribute a colorfully illustrated book written on the primer level. This book could be read in class and then taken home. It would belong to the child, and should include a coloring activity and a sequencing activity (e.g., "What's the first thing you do? The second?"). Follow-up activities would check for

comprehension. There could be cut-outs at the back of the book for sequencing to check for comprehension. Children could cut pictures out and then put in them in the proper order. This book could be used as the story of the day in class, then children could take it home to read it to their parents. It could be a perfect addition to a first-grade phonics curriculum if structured around certain letter sounds (e.g., use words like meat, cheese, peach, and clean). The important thing is that the book include interdisciplinary activities. This book would take about 45 minutes of class time to read and to complete the related activities. It should incorporate math and writing as well." She noted that teachers often received "stand alone" units on specific topics but that they were constantly pressured to cover math, reading, and science subjects with their students. These pressures lead teachers to say, "I'll get to that as soon as I get my academics done," effectively putting other educational curricula "on the shelf."

On the whole, educators and school staff that were interviewed made the following recommendations regarding school-based materials for delivering food safety messages: Put together a good curriculum (core ideas partnered with appropriate resources), make teachers aware of it, and make it available to school at little or no cost to teachers. One science organization representative suggested that USDA/FDA find curriculum developers working in related areas and encourage them to introduce food safety ideas as examples in the texts that they were developing. He suggested that some of the best science curriculum developers to approach with this idea include Education Development Center in Cambridge, Massachusetts; Lawrence Hall of Science, UC—Berkeley; and, Biological Sciences Curriculum Studies, Colorado Springs.

Instructional Activities: What I Have Done and Would Like To Do

Interview participants discussed the need for activities to be hands on in order to maintain interest in the topic and to engage the students in the lesson. One elementary science teacher explained how she keeps students interested. "I have gotten more and more willing to allow students to inquire in areas or topics of interest to them. And I integrate science into everything. I find that the students who are involved in inquiry-based learning are more eager to read and learn." Other teachers echoed this idea. Another elementary science teacher stated, "Kids need hands-on activities so that they can construct their own knowledge. For example, I have my students design and conduct their own experiments." Another teacher explained how she keeps students interested in her family and consumer science classes. "I always make the lessons specific and concrete. Otherwise they (students) would be long gone. I make each lesson relate to a particular kind of food (eggs, meat, etc.). With the age of the students that I teach (K-5) you can't just talk about things in the abstract and you need to keep them busy, keep changing things." She continued, saying that activities for students in this age group have to be hands on. You absolutely have to keep them busy and engaged. "No worksheets for these students."

One director of food services thought that the key to developing a food safety message would be how such a message was dovetailed into existing classroom curricula. "Food safety must be put into existing science, health, or history curriculums," she stated. When asked about history, she said, "This is how people in ancient Egypt handled their food." Another food service representative said, "There are so many creative ways that we could do it (work food safety messages into existing classes). But teachers feel that they are already stretched too thin. They say, 'How dare you give us anything else to teach?' We often take the initiative to get these

messages to students on menus, with visual aids, and with posters in the lunch rooms. We do it for them (teachers).”

Interviewees listed many interesting and innovative food safety activities that they have conducted with their classes and students in the past:

- Growing germs in the classroom—“One thing that I did with my students that was really effective was to use an ultraviolet light to show them the germs on their hands, even after they washed their hands. They were amazed to see how many germs were unaffected by washing, even scrubbing their hands.”
- Touring the school’s food service facilities.
- Showing food safety videos with followup worksheets and laboratory work.
- Inviting and hosting guest speakers to talk about food safety to students.
- Using works of literature such as *Old Black Fly* to learn about food contamination.
- Using interesting hands-on activities— “One exercise I used was to hand out M&M candies. Each student started with a handful of M&Ms. Now, two students had only blue M&Ms while all of the other students had every color except blue. The exercise required that everyone go around and talk to everyone else in the room briefly and exchange an M&M with each person they talked to. They weren’t allowed to look at which M&M they gave away, but by the end of the exercise all but one person had at least one blue M&M in their hand. The purpose was to show how germs are spread.”
- Creating a compost pile—“A big unit I do with my second graders is on decomposition. The students put food scraps into a compost pile outside the classroom and they do a gardening program in the spring and add the compost to their garden. When they look at decomposition, the students choose something from lunch one day and wrap it in a baggy. All the baggies are hung up on a clothesline in the classroom, so that students can watch the food decay over a period of weeks. As they observe the process, they talk about reasons for decay, why some foods decay more quickly, look at the decaying food under a microscope, and stuff like that. And I think this really can bring the concept of food safety home. They remember how the pumpkin smelled when we opened up the bag. They have to experience it upclose and personal so that they change their behavior.”
- Creating special science and research days—“I have a thing that I call ‘research Fridays’ where the students talk about current biological research. Part of this is that students bring in articles on current biology research topics. Some of these have related to food safety in the past, particularly the ground beef scares.”
- Making telephone calls to get answers to questions—I had my class call Hudson Foods as a class on speaker phone. First they called Omaha to find out what happened to millions of pounds of beef. We were told at first that no decision made about it. Over a period of two

weeks we had several conversations with them. They were really nice about it and the children were really interested in the whole thing.”

- Aging food in a refrigerator—“I let a bunch of different foods get old in the refrigerator. Then I show them to the class and ask, ‘If you are making a snack (e.g., moldy pear), is it okay to eat?’ I talk to them about canned goods and ask if a can has a bad dent or if the sides are bulging, is it okay to eat? What about a can of tomatoes that is foamy when you open it? I let bread get really moldy too.”

What Children Like

Informants mentioned a wide variety of activities that students really enjoyed. Most agreed that students liked to participate in hands-on activities and that they wanted to be challenged in a variety of ways. One family and consumer science teacher explained how she did an activity about a girl who went on a picnic and got sick. The students acted as detectives to try to determine what the girl did to get sick. “Kids like that kind of activity,” she stated. One school nurse said her most successful activity was showing students how germs grow. She stated that while students liked videos, they did not really enjoy completing “hand-outs” that often accompanied video presentations of information. Food services personnel agreed that students enjoyed field trips, even if it was just within their school building. “Our home economics classes love coming to the kitchen. Sometimes we turn it into a learning laboratory for them. Students are interested in what we do, and how we do things. They like to have a chance to see how things are done, and to see how they are different than the way things are done at home.” Another food service worker said, “They love coming to the kitchen and having their questions answered,” but she admitted that it is often difficult to tell what students really thought about the activities she presented to them. “It is hard to say what the student reaction is. We have no way of measuring it other than what they say. Usually they don’t tell us too much about what they think.”

One family and consumer science teacher stated that her students liked stories that incorporated clever animation. “Middle school children also like cartoons, and cartoon people. Stories told through cartoons are well received. Children like movies, but they’re not that big a deal to children anymore because they are so inundated with videos these days.” Most teachers agree that how you present a message is often more important than the message itself in terms of getting a child’s attention. “The way you present it really makes the difference. I have found the ‘Department of Health’ approach doesn’t grab them. A presentation of just the facts is too dry. Materials and activities need to be fun and grab their attention. I think *The Danger Zone* does this.”

Technology: Access to It, Use of It, and What I Would Like

All of the interviewees stated that computers were available in their schools, and all were interested in how they could make better use of the technology to deliver food safety and other educational messages. Most schools have computer laboratories to which teachers can get access, and several respondents stated that they have classroom access to the Internet and to networked computers. Those respondents who did not have ready access to the Internet stated that their schools had technology initiatives underway, and that they soon should have Internet capabilities. Nearly everyone interviewed was interested in having access to a food safety Web



page that incorporated food safety messages and activities for students. One family and consumer science teacher stressed that simply making a computer application would not guarantee that students would be interested. "Just because it's on the computer does not mean that students will respond positively. Students don't like to read from the computer screen. On multiple-choice quizzes in applications, they will just punch in a multiple choice answer without reading the question or waiting for feedback for example. It has to be exciting to them." One school nurse warned, "We have a lot of technology in our school, but we were one of the first schools to get computers, and now some of them are getting old and obsolete." While obsolescence is a concern for some schools, in general technology is a key initiative in schools today, and availability of computers—including those with Internet access—is increasing rapidly. One family and consumer science teacher stated that he would like to find an online area where students could interact with the web and explore food safety topics on their own. "What I would really like to see is a great Web site on the topic with lessons, interactive tests, and lesson plans for offline activities." He commented that DINE system has a comprehensive nutrition analysis system, along with an excellent Web site with interactive tests. He said that while he currently does not have the software, he hopes to get it next year. "DINE is \$150 for a site license. That would allow me to have the whole class use it in the lab. That amount of money for a site license is not trivial but not prohibitive. Generally anything more than \$50 begins to be a problem for us, since it requires more approvals and authorizations."

An elementary science teacher explained that her school is the last in the county to have the school technology plan implemented. The school's current computers are old, and students have not been using them as tools for learning content, but for developing computer skills such as programming and keyboarding. "Now that the plan is in place, we're getting new equipment and for the first year the school has a technology specialist. By the end of this school year every classroom will have at least one computer with a CD-ROM drive and Internet access." This teacher is currently in the process of writing a grant to get a digital imaging camera for the unit she teaches on stream life and forest life. She explained that her students would be able to take pictures of organisms and e-mail them to their Internet pen pals who were studying lifecycles. A high school science teacher stated that he had no problem getting access to computers. "I have eight computers in my classroom and access to the Internet right here in the room. I also can take my class to the computer lab across the hall, which has 30 computers." Not everyone is so fortunate. One teacher stated, "Teacher training is still a big barrier to use. We have a lot of computers, but we have had a lot of budget problems in schools; and the first thing to be cut are technology coordinators, which makes it difficult for teachers. Also, even though we have a lot of computers, scheduling in the labs is still a problem."

A high school science teacher explained, "Students like reading the least, videos the next-least, and CD-ROM is their favorite. This is a very visual generation. Ideally, a CD-ROM for high school students would feature some children in the video, and be catchy, quick, and humorous."

A family and consumer science teacher stated, "Overall, over the past 3 years, I have observed more computer use in the schools. I think teachers are more comfortable with Internet and CD-ROM computers in the classroom and projection devices so that the whole class can see what's on the screen." One health teacher told of how he has thought about delivering a satellite conference for schools on food safety. "The Mississippi Food Service Institute, at the University of Mississippi, has done a lot of school lunch research and training. Specifically, they have done

videoconferences for Food Service Personnel in schools. But this kind of a conference has not reached the students yet.” A middle school science teacher thought that the local university’s community level chemistry class (a low-to-basic level chemistry course) was being delivered on the Internet. “I think the web would be a very appealing way for students to do research on the topic of food safety.”

Are Students Interested in Food Safety?

Most of the interviewees agreed that students were interested in their own health and that for the most part students today were interested in taking steps to take care of themselves. This, they agreed, meant that food safety was likely to be well received by students. Several teachers commented that food safety was a topic of importance, especially given the growing number of latchkey children. One school health services director said that while students did show an interest in health issues, the overall status of health education in general was poor nationwide. “Many academic teachers do not agree that, practically speaking, health and such lessons as food safety are of the utmost importance.” One family and consumer science teacher stated, “Students are somewhat curious about food safety. I use articles from a collection of clippings I keep to try to heighten awareness and focus discussion with students about the issue. This helps bring it home to them that this is real.”

One consumer science teacher stated, “The way you can tell if a subject is interesting to children is if they go home and tell their parents about it. I have found that food safety really is of interest to students. They do go home and talk to their parents about it. But the way you present it really makes the difference.” Another family and consumer science teacher said that she noticed that students were interested in the topic. “I have seen that my students are very concerned about cleanliness and what they are going to put in their mouths—more than they used to be. It seems to me that children are much more aware of people getting sick from things they are going to eat. I hear students say all the time, ‘You didn’t wash your hands. Go wash your hands before you do that.’” She offered the particular example of students’ making quesadillas, noting that her students did not need to be reminded that they should wash their hands before working with food. A middle school science teacher noticed that students had also become more acutely aware of food safety issues than they ever had been before. “They get this information primarily through the media,” he stated. A health teacher said that his students had “shown a good bit of interest in the topic of food-borne illness, especially the outbreaks in the fast food industry, like the Jack in the Box case.”

Instructional Goals When Teaching About Food Safety

Goals and objectives for teaching about food safety seemed to be relatively consistent across interviewees. For most teachers and school health service personnel, the main goals were to heighten the awareness of health issues in general and to help students become better managers of their own health. Basic personal awareness of how health management will impact students’ lives is another key goal. One school health services director stated, “I’m so frustrated with the American Public and how they are not being educated health care consumers. I think that preventing health care costs, which anyone can do if they take the time to be informed, should be a major goal in the schools.”

One food service director said, “Parent’s don’t always assume the responsibility to teach their children the basics about cleanliness and sanitation. We (school food service staff) therefore assume that role. Making people aware of the food supply, how to handle it, and where things can go wrong are all important aspects of what we try to convey.” Another food service director explained, “I have a lot of goals with the students. I want to make them aware of our mission, which is to feed a large number of people a good healthy meal. I like them to see, and I want them to know that we are the largest restaurant in town. I want them to see the scale of things, how much larger things are here than they are at their homes. And I like them to see the safety features and the cleanliness of the operation. We wear large woolen gloves for working with hot trays and pans, and these are much larger than the hot pads you would use at home. All of the equipment is very large and the children like that. They like to see the difference between our ovens and the ovens that their moms use. And we have curtains on the refrigerator doors, for example. It is to keep the temperature in the safe zone, and to save energy too. Most children would be surprised to see curtains on the refrigerator. I want them just to see the bigness of the production and see how safety is built into all the meals that we serve.”

In general, goals for teaching food safety involve everything from “providing basic food safety instruction to raising awareness to changing behavior, the whole continuum.” Increasing knowledge, providing models of good behaviors and proper cleanliness were also mentioned.

“Personal hygiene and cleanliness of food preparation areas are my primary messages,” said one family and consumer sciences teacher. One elementary science teacher said the goals had to be clear and simple for her students to understand. “I believe that children know that they need to refrigerate and cook their food well, but don’t understand the ‘why’ of it. Even my best and brightest students don’t really understand bacterial growth and toxins. I try to make that clear to them in a way that they can understand.” He says when he teaches about food safety, he is hoping that students will change their food-safety-related behaviors. He tries to give them an opportunity to internalize the topic and discuss it with other students. “That way they can see how it is meaningful in their lives, and put that into their own bag of tricks for life. Raising awareness is not too hard, but incorporating into daily routine requires continual reinforcement.”

Another elementary science teacher thinks a simple goal should be hygiene, including encouraging students to wash their hands after using the toilet and before eating. “One thing that I have observed is that children are glaringly deficient in the area of handwashing. On a test, as a bonus question, I asked students ‘How many of you wash hands after going to the bathroom?’ Only 18 percent said they did. I’ve seen them in the bathroom. They really don’t want to be bothered with the whole thing.” This teacher believes handwashing is of primary importance, citing that the American Medical Association states that handwashing is one of the top 10 things everyone can do to prevent infection.

Ages/Grades For Food Safety Instruction

Nearly everyone interviewed agreed that middle school grades were the most appropriate place for the food safety messages. While many interviewees agreed that food safety messages could be tailored to any age, grades six through eight were nearly unanimous suggestions as “giving the best bang for the buck.” Several individuals suggested that food safety education should begin in the elementary grades (fourth and under), then be reinforced once in middle school and

once again in high school. The following quotes represent the thinking of teachers, food service personnel and health service personnel on the issue of appropriate age and grades for the food safety message:

- Students are never too young, but it would be best to introduce the message early and then reinforce it throughout their education. I think it would be best to start them with something simple in fourth grade, and then reinforce the message in seventh grade and again during the sophomore year.” (School health services personnel)
- “Third to sixth grades would be best in my opinion. These messages can really be tailored to any age, but third to sixth grade is when we start having a lot of latchkey children, or children who get home from school and want to fix a snack for themselves or sometimes even end up cooking dinner for themselves.” (School food services personnel)
- “The message is appropriate for all ages at some levels, but it would be best to emphasize the message with middle school aged kids. From fourth grade on, and maybe have it as part of their family and consumer education classes.” (School food services personnel)
- “Middle school age is good, especially in eighth grade. In high school, they have vocational foods class so that could be an option. Otherwise students may get some food safety instruction in health, science, or home economics, although a lot of schools don’t have home economics classes.” (Family and consumer science teacher)
- “I think that middle school would be a good age to teach students about food safety, and that students would be receptive to the information at that age.” (Middle school science teacher)
- “All food science classes at the high school level are electives. In middle schools, two courses in family and consumer science are required. These cover family, foods, and sewing topics. Middle school, therefore, is where you would have a captive audience.” (Family and consumer science teacher)
- I believe that eighth grade would be a good place to catch students. Family and consumer science is required at that level. However, they don’t really start cooking on their own at that age, so instruction would need to be repeated at the high school level.” (Family and consumer science teacher)
- “I believe that it [food safety instruction] might be appropriate from fourth grade on. It should really begin in elementary school, be enhanced in middle school, and continued in high school so that it is reinforced.” (Family and consumer science teacher)
- “From early elementary on, it’s important for children to learn about food safety. I know that many kids by fourth or fifth grade are frequently making at least breakfast and snacks for themselves.” (Health education teacher)

Nurses and Cafeteria Staff Involvement in Food Safety Instruction

Most of the teachers and organizational representatives interviewed thought that food service and health services staff could have a limited role in delivering a food safety message to students. As one teacher stated, "I don't see much likelihood of involving school nurses or cafeteria supervisors in this. At my school, the nurse is just part time. She works at the school three hours per day. There is no real interaction between students and the cafeteria supervisor or staff here either." Other instructors agree. One family and consumer sciences teacher said, "Food safety fits better into the classroom. I have had nurses come in and talk about handwashing, and cafeteria staff come in to talk about food preparation, but I think that the classroom is the best setting for instruction." He noted, however, that posters in the cafeteria or nurses office would be great—especially if they are inexpensive or even free to the school. An elementary science teacher said, "We have a full time nurse, and it might be appropriate for him to be involved. Also the cafeteria staff are very kid-oriented and would probably be interested in being involved."

The school health services and food services staff who participated in the interviews agreed that they could play an important role, albeit backseat to teachers, in delivering the food safety message. As one nurse expressed, "Our role is more of reinforcement of messages to the students for the teachers. It can be whatever we make it. Right now it is not our focus. It really should depend on the comprehensive health curriculum for the district. There could be a joint delivery of curricula with teachers, or school nurses could be supplemental speakers in classrooms. I think it is best for the teachers to decide."

School food services personnel largely agree. "It is not realistic for us to do more with food safety issues than we are already doing. While this is a critically important topic, I'm not sure that some teachers would agree. Teachers have strict mandates that have to be adhered to. They have structured educational goals for their students that have to be reached. Currently food safety is not among the most pressing requirements for teachers in our district. However, I would argue that in terms of preparing our students for life, food safety is critical and should be counted among the highest priorities in the education system." Another food service director added, "We can play a vital role, but our role is probably secondary to them getting an educational message in the classroom. They should learn about food safety ideas in class, and then we can be a reinforcement of that message. What we are currently doing with food safety issues on the back of menus and other things like posters goes a long way toward answering questions that students have. It would be nice, though, to have a team approach to coordinate our efforts with the classroom teachers."

Family and Consumer Science as a Setting for Food Safety Instruction

Most of the family and consumer sciences teachers who were interviewed thought that their courses were a perfect fit for food safety education. "Food safety education is a priority for family and consumer science teachers. It is an eight-plus on a ten-point scale for us. But most other teachers don't think it's that important. It is at best a three on a ten-point scale." Most family and consumer science teachers strongly believe that they are the best equipped to provide food safety education since it has been their role historically and they "know how to do it. Several stated that science and health classes would be "distant second choices."

Several science teachers agreed that food safety instruction would best be taught in food related classes. One teacher, however, noted that a small percentage of students took vocational food-related classes (less than 10 percent in his school). Another junior high school science teacher thought that food safety instruction would best be covered along with microbial growth. "I have seen charts up on the walls of home economics classrooms showing the various microbes responsible for food-borne illness and the symptoms of various illnesses." He, too, stated that he was not sure that a home economics course are required for all students.

Several family and consumer science teachers stated that National standards for family and consumer science have been established by State administrators for family and consumer science education. Paid for by the States, these standards incorporate all standards from around the United States, identifying the essential living skills for all students nationwide. Seven subject areas in essential living skills are covered, including nutrition, wellness, relationships, consumer purchasing and education, parenting, family, and human development (and some standards also include food preparation). Competencies and application of knowledge are included, and the whole set of standards is predicated by need to demonstrate competencies. The standards examine and incorporate related academic proficiencies as well. Scenarios for food safety instruction activities and evaluation activities emphasize authentic problems for situational learning. Family and consumer sciences organizational representatives stated that additional materials would be developed to help teachers with the implementation of these standards in their classes. Training will also be provided. The development of the FCS standards has been very controversial. Education leaders say that they have not tried to be prescriptive. The standards allow for some latitude, but they still provide real guidelines for family and consumer science curricula.

While such standards seem to indicate that food safety has a home in family and consumer sciences, organizational representatives are cautious, given a reduction in the number of students who enroll in family and consumer sciences classes. "Like all subjects, you will find that there are ups and downs. But enrollments are increasing these days. We have a sense that people need to have skills for living. Over the next few years, clothing will probably decline since it is not an essential part of living skills these days." Another organizational representative stated, "Whole states are now requiring family and consumer sciences curriculums, and this has happened over the past few years. We don't just live by our academic background." Students, the representatives claim, learn in contextual form far better than in a pure academic form. "We need to reexamine the ways that people can best benefit from education, and understand how we can combine academic and vocational (hands-on) learning for the students' benefit."

Another education representative added, "The educational system in this country is on the verge of a revolution. As you look at things across the country, educational reform didn't work out very well. Education will never be offered in one single way again. You will have to have a multiplistic approach to be successful. There is no magic bullet. Educationally, you will get a lot of coverage in the home economics area because it is one of the most common electives for all students. If you want an educational message to hit, you need to hit students from at least two angles, home economics and the science classes. That way you can get coverage for both the average and below, and the academically inclined students."

"Our ultimate goal is to make kids to become critical consumers," said one organizational representative. Food safety is a part of this mission.

Health Class as Setting for Food Safety Instruction

Many of the interviewees suggested that health classes were devoted mainly to human sexuality, sexually transmitted diseases, and some nutrition components. In many States students are required to take health between the eighth and 10th grades. These courses cover a wide range of topics including sexuality, nutrition, and infectious disease. One family and consumer science teacher suggested that while the health approach explained to students a variety of healthy behaviors, home economics philosophically and practically allowed for more immediate application of the food safety lesson. "That's how you can really change behavior," he stated. One high school science teacher explained that she thought food safety instruction could also be a good fit with sociology, exploring the issue in terms of social mores and customs.

While many health teachers agreed that the message would be a good fit in their curriculum, several indicated that it might not be the best place for the food safety message. "The biggest obstacle in many States is that health education is not required in any grade. Schools are not interested in adding on additional courses or topics due to existing pressure for reading, writing, and arithmetic achievement mandates," one health educator said. "Schools are under pressure to cover many health topics like breast and testicular cancer, drugs, and AIDS. Everyone sees schools as a great way to reach children, and it is, but teachers get overwhelmed." One middle school science teacher who taught on an Indian reservation, said, "Health teachers focus primarily on eating right and living healthy, which is a response to the big problem on the reservation with diabetes and high blood pressure." He said that food safety in and of itself was not a high priority. "The school has a full-time nurse but she doesn't interact with teachers or with students, except when they are ill. The cafeteria supervisor is new this year, and I'm not sure if he will be interested and willing to participate in a food safety initiative."

A representative of a health organization discussed the development of the health standards. The idea that there needed to be health education standards was conceptualized by the Alliance of Health Education, Recreation, and Dance Associations. They developed both Student Standards, (those things that students should be able to do), and the Opportunity to Learn Standards, (what has to happen organizationally). "The response to the health education standards has been very positive response because they are simple, noncontroversial, and logical. Even people in other subject areas have responded very positively." Though there are currently no related materials to support and encourage adoption of the health standards, this interviewee believes that some States have already adopted the standards on their own initiative. At the time the standards were being completed, most States were under considerable pressure to complete their improvement plans for health education. As part of these plans, some States developed materials to systematically translate the health standards into practice. Now 32 States have adopted the standards and have begun to implement them. Within these standards, concern about safety, nutrition, and consumer issues (including dietary consumer issues) are found in three separate standard areas: nutrition, consumer health issues (e.g., food labeling), and disease prevention. According to health standards advocated, the term "food safety" is a misnomer "because it is not really a safety issue; it is a health education issue."

Science as Setting for Food Safety Instruction

Many interviewees agreed that science classes would be the best all-around fit for a food safety message in schools. One concern about placing food safety in science curricula is that they are unlikely to afford the same hands-on opportunities to students as would be found in the home economics curriculum. As one family and consumer science teacher stated, "In science, they get the intellectual aspects but they wouldn't get the hands-on experience, as it is unlikely that food preparation would be allowed in chemistry class." Another drawback is that the curricula are already "full" with science-related items. "They've already got a lot to do. Maybe middle school science teachers would be receptive to the idea, but they too have a full plate."

Science education standards are one reason for this conflict. As one elementary school science specialist stated, "Adoption of the science standards varies by State. Our Department of Education (the State of North Carolina) really got behind the standards and the whole notion of student inquiry initially. They held workshops and summer institutes in preparation for implementation. Then they adopted a program called ABC, which stands for Accountability, Basics, and (Local) Control. This set science education way back." The implementation of ABC means that now the State only tests in reading, writing, and math. Because of the testing schedules, the amount of science that is taught has been reduced. "In middle and high school, this is less of a problem. These teachers have to be trained to teach science, but elementary teachers are generalists and make choices. Since many are not comfortable teaching science and they are not being held accountable for student achievement in science, this limits the amount of science instruction students receive." This informant feels that teachers are really not aware of the National standards. They are more likely to know what is locally mandated. "These standards are not overly prescriptive and their content is very loose. There are two main ideas that no one would compromise on. First, science is for everyone and second, science is inquiry".

Currently, food safety is not a mandated science curriculum item. But many science teachers believe that food safety is a natural fit with science. "Teaching about food safety is a natural for biology teachers, but no other science teachers in my building are doing it. For me, (teaching primarily basic Biology I) time is a big problem. I would like to teach human biology, but I have to go through all of the lower life forms first. I would really like to have the time to address how eating affects your body systems." One high school science teacher related that since the standards were published, schools have held in-service workshops to get familiar with the standards. A problem has been that the school boards keep changing and the school board politics influence the curriculum. The current board is not supportive of the standards for science, but teachers support them in spirit even if they are not being fully implemented.

At the elementary level, many science specialists feel that their primary role as educators is to teach children to read first and foremost. This is their mission and it is critical since the prime time for children to learn to read is ages 5 through 7. "Yes, math, writing, and science are important," one elementary science teacher stated, "but in reality the standardized tests that children take is where teachers are held accountable." Many science teachers think that it is unfortunate that science standards have not been widely disseminated and adopted. One science teacher describes this as a communication breakdown. "Rural districts have not gotten it at all, while larger districts, and especially those with science consultants, have received the standards." At the elementary level there is fear among teachers that a "back to basics" movement could

wipe out science for younger students. "It's easy to teach reading, writing, and arithmetic if you don't teach science, but you're not teaching them everything they need to know. That's why an interdisciplinary approach is critical; it will allow science education to survive." To address this concern, she teaches her students to read and write by using books about science.

Representatives of various science organizations agree that standards in science education impact what is taught and how it is taught. One organizational representative explained that the standards movement began in the late 80s with the National Council for Teachers of Mathematics' (NCTM) releasing curriculum standards for math. Other groups followed suit and developed standards with their own funding as had the NCTM. When Goals 2000 was introduced, funding was provided for the development of standards in six academic subject areas, including science. The National Research Council which comprises a group of scientists, was awarded the contract from the Department of Education to develop the standards. Three working groups were involved in the development of the standards, one group each for content, teaching, and assessment. Approximately 16 to 18 people were on each working group, roughly divided into one-third scientists, one-third teachers, and the remaining third including teacher educators, curriculum developers, and curriculum supervisors.

Currently many teachers nationwide have only a peripheral knowledge of the National standards. Even for those with more in-depth knowledge, standards do not necessarily translate into classroom instruction. Some documents such as "Pathways" (developed by the National Science Teachers Association) provide materials to help bridge the knowledge gap between the standards and classroom practices. A science organization representative noted that all but two States nationwide were involved in developing their own standards, and many States did not embrace the "squishier stuff"—those aspects of science education related to personal behavior and linked with social studies and other humanities courses. "We should keep in mind that it is the State level standards, along with their associated assessments, that really drive what teachers teach," he reminded.

These issues related to curriculum standards for science are important in that food safety is currently not included in the standards. An education representative who participated in the creation of the National standards stated that food safety was never specifically mentioned during the development process, although health and sanitation were discussed. He said that by the time education standards reached a level of specificity of "food safety," the item was substantively buried in a broader science topic, such as "microbial growth." As such, food safety is considered a special interest, many of which compete for instructional time. "Not that food safety is not important. Lots of these issues really can improve the quality of life but it's tricky to know how to bring them into the curriculum." This informant said that he would not be excited about a stand-alone "unit" on food safety. Rather, he believed that the food safety message should be a thread throughout the science curriculum where examples are related to food safety (e.g., observing microbes that grow on meat at various temperatures).

"In science, teachers are really trying to increase understanding. Long term behavior change will be limited unless you increase understanding. Therefore, it is essential to fit the topic into some larger ideas in the science classroom. Biology teachers talk about microbes and to some extent about personal health, so there's a natural connection there." Organizational leaders in the science arena do not envision a rule-based approach for food safety education in science. "This

would be more of a behavior modification rather than a science topic.” One science expert thought that for this reason health and home economics curricula might be more appropriate for a food safety emphasis.



IV. Discussion

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IV. DISCUSSION

Discussion—The complexity of determining placement of food safety messages in the Nation's schools makes it difficult to draw conclusions from the data without reflecting on the findings in terms of the original research questions.

Is there an advantage within the public school system of focusing food safety education as more of a health issue, a home economics issue, or a science issue?—While not as ideal a curriculum fit as home economics, science classes represent the best opportunity for food safety issues to reach the maximum number of students.

Where would food safety instruction have the best chance of finding support in the school environment?—Teachers, administrators, and other school-based staff all concurred that home economics courses were the ideal fit.

Would the concept of food safety education find greater support among classroom teachers or among school support staff (i.e., nurses or food service staff)?—Food safety instruction should be conducted primarily in the classroom, but school health staff and school food service personnel can play an important role in teaching and reinforcing this message.

In which grade or grades should food safety education efforts be focused?—Middle school grades seem to be the most appropriate place for the food safety messages.

Should the educational goal be to raise awareness, increase knowledge, change attitudes, or modify behavior—Or is there some other focus?—USDA/FDA can expect to achieve educational goals in all of these areas.

At what age/grade level are students most receptive to learning about safe food handling techniques?—The middle grades and junior high school grades (grades 5 through 8) appear to offer the best opportunities to integrate food safety education into the curriculum.

What approaches are most compatible with current instructional practices and will encourage maximum usage of a food safety education program?

hands-on activities	television
field trips	video
special events	problem solving
group activities	

What technologies are schools using most, and what formats do teachers and students prefer?—Making use of advance technologies such as computer applications, online services, video capabilities, satellite transmissions, and others is one way of capturing student attention and creating excitement around educational messages.

The findings in this report run the gamut of understanding for issues related to the placement of food safety messages in American schools. The complexity of the overall question makes it difficult to draw conclusions from the data without reflecting on the findings in terms of the

original research questions. What follows is a recasting of findings in a concise discussion based on the original research questions posed by USDA/FDA. Specific recommendations and conclusions follow in the next section.

A. Is there an advantage within the public school system of focusing food safety education as more of a health issue, a home economics issue, or a science issue?

Reviewing the existing curricula guidelines for health, home economic and consumer sciences, and science classes reveals that each of these disciplines has advantages and disadvantages for the placement of food safety messages. Teachers and curriculum developers alike thought that home economics and family and consumer science classes represented the best natural fit for food safety messages in the public schools today. These courses fit well with the hands-on nature of the food safety message, and provide opportunities for students to learn about food safety while actually handling food—a decided advantage for learning over the other two subject area alternatives. Family and consumer sciences, however, has one significant drawback: traditionally this is an elective course and not all students are required to take it. This drawback is perhaps too great to ignore in that the food safety message is too important to let substantial numbers of students fall through the cracks. Another potential problem with placing the food safety message here is the current status of home economics and consumer sciences as a discipline nationwide. Many schools are cutting back on offerings of this course, and still other districts are doing away with this offering altogether. The relatively uncertain future of the home economic/family and consumer science curricula in general makes it less attractive albeit an ideal subject-matter fit.

Nationwide, health education presently focuses on narrowly defined “risk behaviors.” In general, health standards and guidelines are written broadly enough to include food safety messages (e.g., students will demonstrate the ability to practice health-enhancing behaviors and reduce health risks), but little is stated directly regarding food safety issues. As currently stated, *Healthy People 2000* objectives that seem to match with food safety information are included with “Promote Healthy Behaviors” goals. These goals include reducing food-borne infections and reducing salmonella infections among others. The focus of health education curricula on drug use, STDs, pregnancy issues, and other high-risk behaviors makes it an unlikely candidate for the placement of the food safety message. While failing to learn about and practice safe food handling skills could in and of itself be considered a “high risk behavior,” competition for time in the classroom will keep the high profile risk behaviors firmly rooted in health education, leaving little room for the food safety message.

While not as ideal a curriculum fit as home economics, science classes represent the best opportunity for food safety issues to reach the maximum number of students. Since the standards specify that science will be taught to all students, it is clear that if food safety issues are placed here, nearly every student nationwide will be exposed to the message. Existing science curricula are a good fit with concepts similar to those presented in the food safety message, although the presentation would be relatively general. Overall it would seem that a typical high school life science teacher would face some challenges attempting to conduct in-depth units of study on food safety issues—at least in terms of the relatively simple messages

that are currently being disseminated. Focusing on environmental concerns and addressing the science of food safety is one suggested strategy for working food safety into science classes at all grade levels. Science at the lower grade levels are more likely to be oriented to applications of science in daily living activities such as food preparation.

B. Where would food safety instruction have the best chance of finding support in the school environment?

Food safety is most likely to receive support in the family and consumer sciences classes, where they are available. Teachers, administrators, and other school-based staff all concurred that home economics courses were the ideal fit. However, many warned that placing the food safety message in the family and consumer sciences curriculum will not guarantee the maximum exposure of the message to students.

C. Would the concept of food safety education find greater support among classroom teachers or among school support staff (i.e., nurses or food service staff)?

Food safety instruction should be conducted primarily in the classroom, but school health staff and school food service personnel can play an important role in teaching and reinforcing this message. Review of relevant documentation shows that many initiatives currently exist in the Nation's school that link school health and food services to classroom instruction. Many of these initiatives integrate food safety messages, especially with the school food services. The teachers and organizational representatives interviewed thought that food service and health services staff could have a limited role in delivering a food safety message to students, although there was general skepticism as to how involved these staff members realistically could be. Most of the experts interviewed thought that posters in the cafeteria or nurses office would be especially useful and effective.

The school health services and food services staff who participated in the interviews agreed that they could play an important role, albeit backseat to teachers, in delivering the food safety message. Non-classroom staff often feel that they are important contributors to the overall educational experience but that their roles are secondary to those of the classroom instructors. School health and food service personnel will often acquiesce to the authority the teacher in the educational setting. The primary role for school health services and school food services staff should be reinforcement of the educational messages conveyed in the classroom. At the very least, efforts should be made to ensure the message presented by teachers in the classroom is not contradicted by school health service or food service staff elsewhere in the school setting.

D. In which grade or grades should food safety education efforts be focused?

Literature reviews and interviews suggest that students are interested in their own health and that for the most part students today are interested in taking steps to take care of themselves. This suggests that the food safety is likely to be well received by students. Middle school grades seem to be the most appropriate place for the food safety messages. While food safety messages can

be tailored to any age, grades six through eight seem to be the popular consensus among interviewees as the most appropriate grade level to focus on food safety education. Several individual respondents to interview questions suggested that food safety education should begin in the elementary grades (fourth and under), then be reinforced once in middle school and once again in high school. "Students are never too young, but it would be best to introduce the message early and then reinforce it throughout their education. I think it would be best to start them with something simple in fourth grade, and then reinforce the message in seventh grade and again during the sophomore year" (School health services personnel). Middle school grades also represent the time in children's development when they begin to prepare food for themselves on a regular basis. Targeting this age group represents the best option in two ways: it has immediate impact on the health of the student, and it targets an area that the students will be especially curious about and interested in, thereby increasing the likeliness that they will internalize the information.

E. Should the educational goal be to raise awareness, increase knowledge, change attitudes, or modify behavior—Or is there some other focus?

USDA/FDA can expect to achieve educational goals in all of these areas—raising awareness, increasing knowledge, changing attitudes, and modifying behavior—especially when presented to junior high school or middle school students. Gains in high school should be considered as reinforcement of educational messages presented earlier in the education process. High school instruction can also be used to explore more abstract concepts and issues related to food-borne illnesses and other food safety ideas, such as the vocational application of this knowledge.

F. At what age/grade level are students most receptive to learning about safe food handling techniques?

The middle grades and junior high school grades (grades 5 through 8) appear to offer the best opportunities to integrate food safety education into the curriculum for several reasons. First, students at this age are developmentally ready for many of the concepts needed for a comprehensive treatment of food safety. Second, there are three subject opportunities for food safety education—science, health, and family/consumer science. Third, middle schools are often arranged in a team concept so there are more opportunities for cooperation and collaboration at the middle school level than of any other level. Fourth, teachers of students in the middle grades are less bound by coverage requirements than are those in high school. These teachers are more open to thematic units and are in search of activities that are hands-on and relate to daily living. Fifth, students in this age group are typically involved in preparing food for themselves—and in some cases for others in the family—and need this information.

High school grades should also be considered for food safety education, although instruction here should be considered review and reinforcement of messages taught at the lower grades. Elementary and grade school levels (grades K through 4) are best for teaching only the very basics regarding food safety and should focus primarily on personal hygiene and health issues only in the broadest sense. Existing materials for these grade levels are appropriate and consistent with this thinking.

The first part of the paper discusses the importance of the study and the objectives of the research. It also provides a brief overview of the methodology used in the study. The second part of the paper presents the results of the study and discusses the implications of the findings. The third part of the paper concludes the study and provides some final thoughts on the research.

The results of the study show that there is a significant relationship between the variables studied. The findings suggest that the study has some practical implications for the field of research. The study also highlights some areas for further research and provides some suggestions for future studies.

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G. What approaches are most compatible with current instructional practices and will encourage maximum usage of a food safety education program?

Students enjoy a wide variety of educational presentations. Educational experts agree that students prefer to learn and will incorporate their learnings into attitudes, behaviors and knowledge more readily when they enjoy their lessons. Most of the experts and educators with whom we talked agreed that students liked to participate in hands-on activities and that they wanted to be challenged in a variety of ways. Field trips and special events add excitement to learning and were mentioned by teachers, food service staff, and curriculum experts as ways to enhance the learning experience for students. Television and video are popular with students as well, but students do not typically enjoy the additional assignments, such as worksheets, that often accompany these media presentations. Students do enjoy problem solving and group activities, and they do enjoy taking ownership of their educational process. Portfolio management and group problem solving exercises represent a nontraditional approach to education that seems to work well with most students.

H. What technologies are schools using most, and what formats do teachers and students prefer?

Teachers also recognize the importance of introducing units of study to students in exciting and innovative ways. Making use of advance technologies such as computer applications, online services, video capabilities, satellite transmissions, and others is one way of capturing student attention and creating excitement around educational messages. Computers are nearly ubiquitous in the Nation's schools today, as are televisions and VCRs. Most schools have computer laboratories to which teachers can get access, and several respondents stated that they have classroom access to the Internet and networked computers. Those respondents who did not have ready access to the Internet stated that their schools had technology initiatives underway, and that they will soon have Internet capabilities. Educators expressed interest in learning how they could make better use of these technologies to deliver food safety and other educational messages.

Interest in having access to a food safety Web page that incorporated food safety messages and activities for students is high among educators. Educators are adjusting their teaching styles to reflect student interests in the learning process. Internet and CD-ROM delivery methods are the most popular among students and facilitate group learning and portfolio educational styles that are popular in schools today. Food safety issues are readily adaptable to thematic units of study in many educational areas including math, science, home economics or family and consumer sciences, health, and other areas within existing school curricula.

Other technological considerations include making use of the variety of telecommunications options available to educators today. Special events, such as television programming, video teleconferences, online discussions or "chats" with experts, and other singular and timely "events" can facilitate the presentation of educational messages that are eagerly anticipated by students and teachers alike. Given that much of the food safety message can be taught in

relatively short timeframes, special event presentation is one excellent way to ensure interest in such an initiative.



V. Conclusions

V. CONCLUSIONS

The following conclusions have been reached through the research and have resulted in the following recommendations:

- Consider moving some of the food and drug safety objectives to health promotion, rather than keeping them under health protection in *Healthy People 2010*.
- Work with textbook publishers to ensure that there is adequate and appropriate coverage of food safety topics.
- Compile and distribute a resource guide for materials that are currently available. Improve access to high quality “orphan” materials.
- Family/consumer science classes provide an ideal setting for food safety education. The hands-on aspects of the cooking classroom make it ideal for developing food safety habits as well as increasing knowledge about the topic. In terms of reaching the most students, science seems to offer the most promise. We have provided an analysis of the science curriculum standards and indicated where food safety instruction could best fit. However, it will be important to develop materials that focus on developing scientific concepts and deepening student understanding of the living world. Simple food safety messages are not likely to appeal to or be adopted by science teachers.
- Promote the importance of food safety education at various organizational levels—National initiatives that have a trickle-down influence on education (e.g., *Healthy People 2000*, *Goals 2000*); groups involved in curriculum standards development for relevant subject areas; regional and State mandates and curriculum frameworks; school district curriculum supervisors; and individual classroom teachers.
- The middle grades (5 through 8) appear to offer the best opportunities to integrate food safety education into the curriculum for several reasons. First, students at this age are developmentally ready for many of the concepts needed for a comprehensive treatment of food safety. Second, there are three subject opportunities for food safety education—science, health, and family/consumer science. Third, middle schools are arranged in a team concept so there are more opportunities for cooperation and collaboration at the middle school level than of any other level. Fourth, teachers of students in the middle grades are less bound by coverage requirements than are those in high school. These teachers are more open to thematic units and are in search of activities that are hands on and relate to daily living. Fifth, students in this age group are typically involved in preparing food for themselves—and in some cases for others in the family—and need this information.
- Upper elementary school and high school also offer some opportunities.
- There are few materials that take into account populations with special educational needs. These include populations those with limited English proficiency and low literacy skills as well as those who have cognitive or other disabilities. We believe that it is very important to

take into consideration the needs of these populations as many of them enter the food service industry.

- There is a need to do a thorough, comprehensive review of existing materials and to compile and cross-index a listing of the materials that are considered to be of high quality. There are a limited number of print materials that appear to be of high quality from a content perspective, but that need to be laid out in a more attractive format to encourage use. Once this reformatting is accomplished, it would be desirable if there was a single source from which educators could obtain the materials.
- Print, video, and audio materials have a relatively long shelf life—as long as they are sound from a content and design perspective. The same cannot be said for computer applications. Not only are there issues related to platform compatibility, but also in the arena of high tech instructional materials the bar keeps going up. Therefore, there is a need to invest carefully in such materials. At the current time, schools seem to be moving strongly to use of the Internet as an informational and instructional resource although it seems likely that CD-ROM will remain important in schools for several years, and a successor (e.g., DVD) will take over once that has been relegated to antiquity.
- School officials (e.g., teachers, school health professionals, school food service personnel, and administrators) recognize the need to work new educational initiatives into existing curricula rather than to attempt to introduce new curricula. Food safety issues are perfect for thematic units of study in many educational areas including math, science, home economics or family and consumer sciences, health, and other areas within existing school curricula. Teachers also recognize the importance of introducing units of study to students in exciting and innovative ways. Making use of advance technologies such as computer applications, online services, video capabilities, satellite transmissions, and others is one way of capturing student attention and creating excitement around educational messages. Special events, such as television programming, video teleconferences, online discussions or “chats” with experts, and other singular and timely “events” can facilitate the presentation of educational messages that are actually eagerly anticipated by students and teachers alike. Given that much of the food safety message can be taught in relatively short timeframes, special event presentation is one excellent way to ensure interest in such an initiative.

Appendix A

Teacher Interview Protocols

USDA /FDA Food Safety Initiative: TEACHER INTERVIEW

Date: _____ Time: _____
 Respondent's phone number: (____) _____

Introduction: Greetings, name, ask if a good time. If not, reschedule.
 Educational researcher working for the USDA/FDA
 Interested in the your thoughts on food safety education in the schools
 All responses are confidential
 Interview will take approximately 30 minutes

Thank you for participating in this interview.

Basic Demographics	
1 — Name: _____	2 — Position Title: _____
3 — Age: <input type="checkbox"/> 22-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-50 <input type="checkbox"/> 51-60 <input type="checkbox"/> 61 or older	4 — Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
5 — Total Years Experience as a Teacher <input type="checkbox"/> 3 or less <input type="checkbox"/> 4-8 <input type="checkbox"/> 9-13 <input type="checkbox"/> 14-19 <input type="checkbox"/> 20 or more	6 — Subjects That You Teach: _____ _____ _____ _____ _____
7 — Number of Students You Teach: _____ per class _____ per day	8 — Ages You Serve: <input type="checkbox"/> 4-7 <input type="checkbox"/> 8-11 <input type="checkbox"/> 12-15 <input type="checkbox"/> 16-19 <input type="checkbox"/> 20 and older
9 — Name of School: _____	10 — Type of School: <input type="checkbox"/> Public <input type="checkbox"/> Private
11 — Address of School: _____ _____ _____	12 — Urbanicity of School <input type="checkbox"/> Urban <input type="checkbox"/> Suburban <input type="checkbox"/> Rural
13 — Students' Ethnicities <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Pacific Islanders <input type="checkbox"/> Native American <input type="checkbox"/> Other: _____	14 — Interviewed By: <input type="checkbox"/> Elaine Robey <input type="checkbox"/> Patrick Koepl <input type="checkbox"/> Jim Craver <input type="checkbox"/> Other: _____ _____

15. Over the past year or two in what ways have you personally become more aware of food safety issues? How did you gain this information?

16. What, if anything, have you taught your students about food safety? What specific food safety topics have you taught? If **not** teaching food safety, why not?

17. What materials / activities did you use to teach the topics you just described? What made you decide to use these materials?

18. Looking back on the lessons, what would you like to have done better? What would have made the lessons more effective?

19. What was your students' reaction to the lesson?

20. What did you hope to accomplish by teaching these lessons? What were your goals?

21. At what grade level do you think food safety lessons would be most effective? At what grade level do you think students will be most responsive and receptive to this message?

22. What are the most important food safety messages to convey?



23. How did you decide to teach a food safety lesson or unit? (PROBES: school mandate, personal interest, other)

24. In your opinion, in what part of a typical curriculum should food safety be taught? (PROBES: health, home ec., "science," other) Is food safety a good fit educationally for the subjects you teach? What subject or course area would be the optimal for food safety lessons? How did you come to this answer?

25. How have teachers other than yourself taught food safety in your school? In what context have they taught food safety? What other avenues might be appropriate? Why?

26. What priority do you place on food safety education? What priority do others place on it (e.g., other teachers, administrators, parents, nurses, etc.)

27a. **IF FOOD SAFETY IS NOT IN PLACE, ASK:** What would the process be for getting a food safety curriculum in place in your school? What avenues would have to be pursued, and with whom? Do you perceive food safety as a priority issue? What are the barriers to teaching about food safety in the schools?

27b. **IF ALREADY IN THE SCHOOL, ASK:** "Who has been involved to date in getting food safety into your district? What was the adoption process?"

28. Beside teachers, who else in your school plays a role in food safety education? Are these venues as good as the classroom? Why or why not?

29. What should the educational goal for food safety education be? How would this vary with the age of the students? How would this vary with the subject to which the food safety curriculum is linked? (Probe for words such as "raise awareness," "increase knowledge," "change attitudes," and "modify behaviors.")

30. What are the advantages and disadvantages of the media and materials you have used to teach food safety? Do other teachers choose to use these media and materials as well? (PROBE: technologies)

31. To what degree is technology infused into your school's instructional program? Do you have easy access to interactive multimedia equipment and applications? Do you have easy access to the Internet? How often do you use these with your classes?

32. Given a choice between different delivery mechanisms, which would you choose and why? What are you most likely to use, and why?

USDA /FDA Food Safety Initiative: SCHOOL HEALTH PERSONNEL INTERVIEW

Date: _____ Time: _____
Respondent's phone number: () _____

Introduction: Greetings, name, ask if a good time. If not, reschedule.
Educational researcher working for the USDA/FDA
Interested in the your thoughts on food safety education in the schools
All responses are confidential
Interview will take approximately 30 minutes

Thank you for participating in this interview.

Basic Demographics	
1 — Name:	2 — Position Title:
3 — Age: <input type="checkbox"/> 22-30 <input type="checkbox"/> 31-40 <input type="checkbox"/> 41-50 <input type="checkbox"/> 51-60 <input type="checkbox"/> 61 or older	4 — Gender: <input type="checkbox"/> Male <input type="checkbox"/> Female
5 — Total Years Experience as a School Health Professional <input type="checkbox"/> 3 or less <input type="checkbox"/> 4-8 <input type="checkbox"/> 9-13 <input type="checkbox"/> 14-19 <input type="checkbox"/> 20 or more	6 — Describe your Duties:
7 — Number of Students You See: _____ per school _____ per day	8 — Ages You Serve: <input type="checkbox"/> 4-7 <input type="checkbox"/> 8-11 <input type="checkbox"/> 12-15 <input type="checkbox"/> 16-19 <input type="checkbox"/> 20 and older
9 — Name of School:	10 — Type of School: <input type="checkbox"/> Public <input type="checkbox"/> Private
11 — Address of School: _____ _____	12 — Urbanicity of School <input type="checkbox"/> Urban <input type="checkbox"/> Suburban <input type="checkbox"/> Rural
13 — Students' Ethnicities <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Pacific Islanders <input type="checkbox"/> Native American <input type="checkbox"/> Other. _____	14 — Interviewed By: <input type="checkbox"/> Elaine Robey <input type="checkbox"/> Patrick Koepl <input type="checkbox"/> Jim Craver <input type="checkbox"/> Other. _____

15. Over the past year or two in what ways have you personally become more aware of food safety issues? How did you gain this information?

16. What, if anything, have you taught students about food safety? What specific food safety topics have you discussed with students? If not discussing food safety, why not?

17a. What materials / activities did you use to discuss the topics you just described? What made you decide to use these materials?

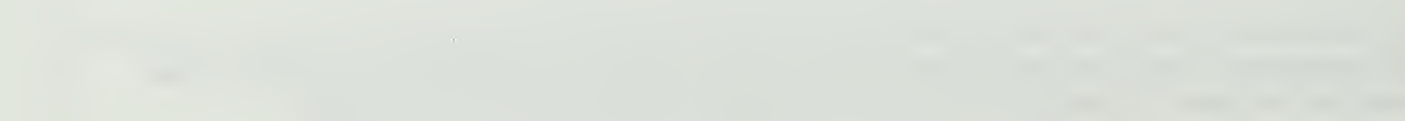
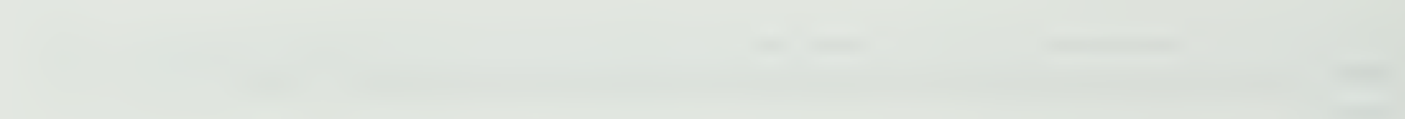
17b. In what settings did you provide this instruction (e.g. classroom, nurses office, other)?

18. Looking back on the discussions you've had with students, what would you like to have done better? What would have made the lessons you taught more effective?

19. What was the students' reaction to these discussions?

20. What did you hope to accomplish by educating students with these discussions? What were your goals?

21. At what grade level do you think food safety lessons would be most effective? At what grade level do you think students will be most responsive and receptive to this message?



22. What are the most important messages to convey?

23. How did you decide that a food safety message was needed? (PROBES: school mandate, personal interest, other)

24. In your opinion, in what part of a typical curriculum should food safety be taught? (PROBES: health, home ec., "science," school health clinic or department, other)

25. Is food safety a good fit educationally for your job and your role in the schools that you serve? How can a strong food safety message best be presented to students that you serve? How did you come to this answer?

26. How have teachers in your school taught food safety in the past? In what context have they taught food safety? What other avenues might be appropriate? Why?

27. What priority do you place on food safety education? What priority do others place on it (e.g. other nurses, teachers, parents, administrators, etc.)?

28a. **IF FOOD SAFETY IS NOT IN PLACE, ASK:** What would the process be for getting a food safety curriculum in place in your school? What avenues would have to be pursued, and with whom? Do you perceive food safety as a priority issue? What are the barriers to teaching about food safety in the schools?

28b. **IF FOOD SAFETY IS ALREADY IN THE SCHOOL, ASK:** "Who has been involved to date in getting food safety into your district? What was the adoption process?"

29. Beside the school health professional staff, who else in your school plays a role in food safety education? Are these better venues for a food safety message than via school health personnel? Why or why not?

30. What should the educational goal for a food safety curriculum be? How would this vary with the age of students? How would this vary with the subject to which the food safety curriculum is linked?

31. What are the advantages and disadvantages of the media and materials you use to teach students about food safety? Do other school staff prefer to use these media and materials as well? (PROBE: technologies)

32. To what degree is technology infused into your school's instructional program? Does the school have easy access to interactive multimedia equipment and applications? Does the school have easy access to the Internet? How often do you use these with students?

Appendix B

List of Documents Reviewed in Preparation of this Report

The University of

the State of New York

in the City of New York

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
<i>Danger Zone, The</i>	Unknown	Modern Sponsored Marketing Services 3645 Crooks Road Troy, MI 48064 800-237-8913 Partner: USDA/FSIS	Curriculum Includes videocassette (25 min.), teacher's guide with reproducible learning activities, colorful poster, and post-test The manual provides handouts and four learning activities for each of three subject areas—health, family/consumer science, and science.	Adolescents, youth; junior high school students; perhaps usable with 6th-graders and 9th-graders as well.	This video teaching package is designed for science, health, and family/consumer science teachers at the middle-school level. Students join a class that encounters Fester, a villain who encourages them to eat food that has been in the Danger Zone too long. Upon completion of the program, students will be able to describe the role of bacteria in contaminating food; demonstrate how time, temperature, and cleanliness affect bacterial growth; identify the four major types of bacteria that cause food-borne illness and in what foods they are commonly found; and discuss how to control growth of bacteria to prevent food-borne illness. Content coverage is similar to that of <i>Food Safety Is No Mystery</i> . Strong emphasis on keeping food out of the danger zone (40–140 degrees F.) for prolonged periods.
<i>Diner Detective—Educational Program for Food Service Employees</i>	1997	Matrid K. Ndile Dept. of Food Science and Technology 122 Vivian Hall, 2121 Fyffe Road Ohio State University Columbus, OH 43210 614-292-3069	Curriculum Includes manual, laminated posters, and videocassette	Adolescents, food service workers	This curriculum is aimed at training teenage and young-adult food service workers. It could also be used for a high school class.
<i>Discovering Food Safety: Detective Mike Robe's Fantastic Journey for Head Start Preschoolers</i>	1996	Lori Pivarnik or Martha Patnood University of Rhode Island Cooperative Extension Service Food Science and Nutrition Dept. University of Rhode Island 530 Liberty Lane West Kingston, RI 02892 401-874-2972	Curriculum Includes teaching outline for six lessons, student activities, and videotape (10 min.)	Preschoolers	This project is a redesign of the elementary-school food safety program of the same name to a curriculum designed for preschoolers and children into kindergarten and first grade. Brochures and other materials that are recommended for use are not included with the kit. Also includes a 1-hour food safety education program for parents.
<i>Discovering Food Safety—Detective Mike Robe's Fantastic Journey</i>	1992	Same as for <i>Discovering Food Safety: Detective Mike Robe's Fantastic Journey for Head Start Preschoolers</i>	Print materials and slides	Children in grades 2–3	This curriculum was designed for second- and third-graders. It consists of a slide series, a science experiment, a guide and script for a puppet show, and outlines for other activities and games related to food safety.
<i>Don't Get Caught Dirty Handed!</i>	1996	Centers for Disease Control and Prevention (with grant from Bayer Pharmaceuticals)	Campaign materials (poster, slickers, brochure, factsheets, press release) Game	General public	Focuses exclusively on the importance of handwashing for disease prevention.
<i>Don't Get Bugged by a Food-borne Illness</i>	1996	Alice Henneman University of Nebraska—Lincoln Cooperative Extension 444 Cherrycreek Road Lincoln, NE 68528-1507 http://lanrwww.unl.edu/lanr/lanco/family/buggame.htm		Consumers, children, youth, adolescents	This product is a quiz game consisting of food safety questions. The program package includes master copies of all materials needed to play the game, including materials to help market, present, and evaluate the program.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Educational Program to Train Food service Workers, An	1992	Fudeko Maruyama University of Kentucky Cooperative Extension Service 121 Erikson Hall Lexington, KY 40506 606-257-3888	Videocassette (3 parts, 90 min. each), guidelines for facilitators, activities, food safety calendar, certificate of completion, miniposters, HACCP checklist	Food service workers	Food service workers who prepare and serve food to high-risk clientele (young children at daycare facilities and the elderly at senior-citizen centers) are the target audience of this distance learning satellite program. The program is presented in three parts of 90 minutes each. Part 1, "Mean About Clean: Warfare on Germs," focuses on personal cleanliness and kitchen sanitation. Part 2, "Clean From Start to Finish: Prepare, Cook and Serve Food Safely," looks at receiving/purchasing food and storing, preparing, and cooking food safely. Part 3, "Hot or Cold, But Not In Between: Serving, Transporting and Holding Food," discusses transporting and serving food, handling home-delivered meals, and controlling pests. Activities to do during break times are included.
Educator's Food Safety Slide Set and Script, The	Unknown	Institute of Food and Agricultural Sciences Building 120, Room 103 Newell Dr. University of Florida P.O. Box 110365 Gainesville, FL 32611 352-392-2030	Slides and script	Adult food professionals and food handlers	Covers the epidemiology of food-borne illness, risk assessment, compromised populations, and the dynamics of microbial contamination, packaging, and specific food-borne illnesses.
Fight Back! A National Public Education Campaign to Reduce the Risk of Food-borne Illness	1997	Partnership for Food Safety Education	Campaign materials (print, audio and video public service announcements)	General public, students	Educational materials are based on four easy-to-remember messages: "Clean: Wash hands and surfaces often," "Separate: Don't Cross-contaminate," "Cook: Cook to proper temperatures" and "Chill: Refrigerate promptly." Includes background information on food-borne illness and a factsheet on the Partnership for Food Safety Education.
Food Protection Video Series	Unknown	Institute of Food and Agricultural Sciences Building 120, Room 103 Newell Dr. University of Florida P.O. Box 110365 Gainesville, FL 32611 352-392-2030	45-minute videotape	Adult food professionals and food handlers	Covers five major topics: Food Safety and Personal Hygiene; Receiving, Storing, and Record Keeping; Thawing; Cooking, Cooling, and Holding; Serving; and Cleaning and Sanitizing.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
<i>Food Risks: Perception vs. Reality—A Program to Promote Food Risk Awareness and Understanding</i>	1993	FDA/International Food Information Council Foundation http://vm.cfsan.fda.gov/~dms/risk-loc.html	Curriculum guide (includes student handouts and a poster)	Grades 9-12	This program presents important food safety information to high school students and encourages critical thinking skills. Specifically, it provides information that will help students to analyze media reports about food safety and determine the reliability of the information and the risk to them or their family; commit to memory the information needed to evaluate risk potential and take appropriate steps to avoid or to minimize risk; be motivated to keep informed about food safety issues and to take the steps necessary to avoid or minimize food safety risks. The program is intended to increase students' awareness of all kinds of food risks—such as food additives and environmental contaminants—as well as food-borne illness. There are eight lessons and a test. The curriculum guide includes a correlation of lessons with popular textbooks for health, family/consumer science, and science (biology, chemistry, and general).
<i>Food Safety and Quality Programs for Navajo Audiences Delivered by Touch Screen Interactive Multimedia Systems</i>	1993	Jeanne Gleason Box 30003, Dept. 3A1 Cooperative Extension Service New Mexico State University Las Cruces, NM 88005 505-646-2701 Partners: W.K. Kellogg Foundation	Report and pictures of interactive kiosk that was developed	Navajo consumers	A touchscreen multimedia information program to deliver food safety and quality information to Navajo audiences at the Navajo Food Distribution Center as well as at the youth and WIC centers. A computer-controlled system incorporated computer graphics, laser disc video, computer-generated text, and English/Navajo audio. Social and cultural issues are addressed in the materials. The system was housed in a mobile kiosk that circulated in Navajo lands.
<i>Food Safety at Home, School, and When Eating Out: An Activity Book for You to Color</i>	1997	USDA/FSIS and The Chef and Child Foundation of the American Culinary Federation, Inc.	Coloring book	"Young children," probably ages 4-8.	Simple messages to teach safe food handling habits. Covers the concept of bacteria, handwashing, safe food handling, food labeling, washing fruits and vegetables, keeping foods refrigerated, avoiding food contamination, and keeping hot foods hot and cold foods cold. Provides two recipes so that the child can practice safe food handling while preparing food.
<i>Food Safety Bingo</i>	Unknown	NASCO 901 Janesville Ave. P.O. Box 901 Fort Atkinson, WI 53538	Game	Youth, adolescents	Although the primary resource for this bingo game was <i>Preventing Food-borne Illness: A Guide to Safe Food Handling</i> , by the USDA, (Home and Garden Bulletin Number 247, 1990), there are several misleading statements used, such as "Most food-borne illness grows in temperatures of 60 to 125 degrees F"; those can be changed by the user.
<i>Food Safety Can Be Fun</i>	1996	Ontario Agri-Food Education Inc. P.O. Box 460 144 Townline Road Millton, Ontario, Canada L9T 4Z1 905-878-1515	Curriculum includes videocassette, teacher preparation, activity guide	Adolescents	"Food Safety Can Be Fun" is an episode of <i>Street Cents</i> , the popular CBC (Canadian Broadcasting Corporation) consumer television series. The episode consists of segments in which aspects of food safety are highlighted. The video serves as a motivator to introduce food safety concepts into the classroom or a youth group gathering. The accompanying guide develops the concepts introduced in the video through specific activities and additional information. Students are encouraged to involve the family in food safety awareness and even gather data in the home. The video is geared towards students in grades 7 to 10 (ages 12 to 17).

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Food Safety Community Action Plan	1994	Barbara Selover National Cattlemen's Beef Association 444 North Michigan Ave., Suite 1800 Chicago, IL 60611 800-368-3138 Partners: Assn. of State and Territorial Health Officials, Assn. of State and Territorial Public Health Nutrition Directors, Nat. Assn. of County and City Health Officials	Booklet, 31 pages	Community planners, consumers	The ideas offered in this guide are intended for both the public and health extension professionals. Sections include specific tactics for reaching consumers, teachers, children, and food handlers. Sample public service announcements and press releases are offered, in addition to an outline for developing a crisis communications plan for responding to outbreaks of food-borne illness.
Food Safety Consumer Publications	Unknown	April Mason Purdue University Cooperative Extension Service 1264 Stone Hall Purdue University W. Lafayette, IN 47904 765-494-8539		Consumers, children, youth	These consumer brochures are short discussions of food safety issues. Titles are: "Keeping food safe during emergencies," "It must have been something I ate," "What are all those chemicals in my food," and "The pesticide paradox."
Food Safety Express—Food Safety Education for Preschool Children	1993	University of Missouri Cooperative Extension Service Food and Nutrition Extension 308 Gwynn Hall University of Missouri Columbia, MO 65211 (area code) 14-882-5117	Curriculum includes videocassette (five vignettes), teacher's manual, activity manual	Children	This program is designed for use with preschool children ages 4 through 6 and with children in kindergarten and first grade. The program consists of five video vignettes featuring puppets who introduce food safety topics in an entertaining way. Titles of the vignettes are: 1) "Don't Eat Worms or Germs," 2) "How to Eat a Cracker," 3) "How to Open Food," 4) "How to Eat Spaghetti," 5) "Peanut Butter and Belly Sandwich." In addition to the video, a teaching manual includes plans for five lessons featuring one of the video vignettes with a lesson overview, objectives, and suggested activities for home and school; directions for activities, including supply lists; and background information about microorganisms and food safety.
Food Safety Is No Mystery	1987	USDA/FSIS	Videotape and print materials	Low-level food service workers; could also be used in a high school food service curriculum	Four modules in a mystery format in which the mystery to be solved is looking for the source of illness. Main characters are a Carmen San Diego-type character and her less-knowledgeable partner. The four modules are "Sanitation" (in restaurant kitchen); "Food Preparation" (in nursing-home kitchen); "Contamination" (in school cafeteria); and "Safe Cooling and Reheating" (in hospital kitchen). Learning points for each module are summarized on text screens at the end of each module.
Food Safety Project	1997	Peggy Sherry Iowa State University Extension Iowa State University Ames, IA 50011-2030	World Wide Web site that includes food safety lessons along with other food safety information	General public, high school students	This food safety module is presented in four lessons: Lesson 1: "What's bugging you?"; Lesson 2: "What are Consumer Control Points?"; Lesson 3: "Where is the Danger Zone?"; and Lesson 4: "Who is FAT TOM?" (Food—Acidity—Time—Temperature—Oxygen—Moisture). Includes a glossary and test consisting of multiple choice and true/false questions. The student receives immediate feedback on his/her score. The program will instruct students to print out one certificate per lesson.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Food Safety Training Manual: Employee and Manager Editions, The	Unknown	Institute of Food and Agricultural Sciences Building 120, Room 103 Newell Dr. University of Florida P.O. Box 110365 Gainesville, FL 32611 352-392-2030	Training manual	Adult food professionals and food handlers	Covers safe methods for handling and preparing goods, State food code requirements, personal hygiene, receiving and storing foods, thawing, food preparation and cooking, thermometer calibration, serving food and storing leftovers, and cleaning food storage and preparation areas.
Germ Squirm—Kids and Safe Food Handling	1993	Ann A. Hertzler Virginia Tech, Human Nutrition and Foods Virginia Cooperative Extension Service 223 Wallace Hall Blacksburg, VA 24061 703-231-4673 To order: Extension Distribution Center 112 Landsdowne St. Blacksburg, VA 24061-0512 703-231-6192	4-page brochure	Children ages 2-6	This guide for teachers is divided into activities and questions for 2-to-3-year olds, 3-to-5-year-olds, and 4-to-6-year-olds. Activities teach children to identify dirt and places where germs live and hide; identify "good" and "bad" germs and how to get rid of germs; classify ways to fight germs while eating out; demonstrate steps for washing hands, utensils, and food; show clean dish and food handling techniques; name rules for cleaning up spills; identify safe practices for cleaning supplies; and demonstrate safe food storage techniques.
Get a Jump on Germs: Making Food Safer	1997	Jerry Newman Dept. of Human Development 323 Hulbert Hall, P.O. Box 646236 Washington State University Pullman, WA 99164-6236 509-335-2800 Fax: 509-335-2808 E-mail address: newmanj@mail.wsu.edu	Print curriculum; includes activities, teaching guides, and background information	Children, youth, adolescents	This curriculum provides hands-on exploratory science activities designed for youth to learn about food safety. The University of California SERIES (Science Experiences and Resources for Informal Education Settings) science education model was used as the curriculum model. Originally geared towards grades 3-5 4-H youth involved in livestock and foods and nutrition projects, it is also suitable for older or younger audiences.
Glitter Bug	Unknown	Brevis 3310 South 2700 East Salt Lake City, UT 84109 800-383-3377 Fax: 801-485-2844 E-mail address: bbrevis@xmision.com	Glitterbug powder or pollen, ultraviolet light, manual, motivational cards	Food service workers, children, adolescents, youth	This kit teaches proper handwashing techniques. Students put on powder or pollen, wash hands, then put them under the ultraviolet light. Powder or pollen that remains on hands after washing shows up on hands under the UV light. Teaching materials then show proper handwashing techniques.
Glo-Germ	Unknown	Glo-Germ Company P.O. Box 537 Moab, UT 84532	Choice of three kits, depending on light source. All kits include oil, powder, and some form of light.	Children, youth, adolescents, food service workers	Glo-germ is a kit that helps teach handwashing, aseptic techniques, and general infection control. The kit consists of an oil, a powder, and a special fluorescent lamp. The oil and powder contain plastic "germs," and the lamp reveals the germs. Students apply either the oil or the powder and then work through their normal handwashing procedure. The fluorescent lamp is then used to spot any remaining germs.

Appendix C

Matrix of Products Reviewed

Food Safety Education Materials

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/Organization
Adventures with Mighty Egg	1993	American Egg Board 1460 Renaissance Drive Park Ridge, IL 60068 847-296-7043 http://www.aeb.org	Curriculum includes slickers, poster, activities, recipes, eight lesson plans, reading list	Children	This integrated curriculum unit for grades K through 3 features a hands-on approach. It was designed to encourage students to want to know more about eggs and other subjects as they develop math, science, language arts, creativity, and other skills. Safe handling of eggs is integrated into some of the lessons.
Bacterial Contamination of Foods	1996	Lynne Brown Dept. of Food Science 203-B Boriand Pennsylvania State University University Park, PA 16802 814-863-3973	Curriculum contains 18 lessons with objectives, teacher preparation information, activities, test, and transparency masters. Includes videocassettes—"The Mystery of the Poisoned Panther Picnic" and "Dirty Dining"	Grades 7-10; youth, adolescents	This curriculum is geared toward grades 7 through 10 and is multidisciplinary, encompassing lessons for science, math, family/consumer science, and social studies classes. Each lesson is designed for a 30-minute class period. General study areas are bacterial contamination of food, food ingredients, genetic engineering, and chemical residues.
Chances and Choices with Food	1992	Marla Relicks Minnesota Extension Service 1420 Eckles Avenue 340 Coffey Hall University of Minnesota St. Paul, MN 55108 612-625-5242	Curriculum includes a videocassette, five lessons with lesson plans, student handouts, background information for educators, followup activities, discussion points, and pre- and post-tests. Handouts for parents are included.	Children, youth	This food safety curriculum for grades 4 through 6 includes a video and five lesson plans that encourage critical thinking. The first three lessons deal with food safety concepts that are important for youths who care for themselves; they cover food-handling skills in buying, preparing, cooking, and storing foods, and handling leftovers. The fourth lesson addresses concerns youths may have about food additives and pesticides. The fifth lesson is about water. Pre- and post-test evaluation tools are included, as well as take-home activities for each lesson.
Creating Informed Citizens for Tomorrow's Food Safety Decisions	1994	Karen Wilken Cooperative Extension Service Department of Food Science & Human Nutrition Colorado State University Fort Collins, CO 80523-1571 970-491-5798 Fax: 970-491-7252	Curriculum manual, facisheet handouts, slides and script, videocassette (AV materials are not included in the curriculum, but information on how to obtain them is given.)	Middle, junior, and high school teachers and students	Curriculum with eight chapters. Each chapter includes lesson outline, background references, student activities, discussion questions with answers, glossary of key words, and test questions. According to the developers, "This comprehensive, interdisciplinary food safety curriculum was designed for middle/junior high school teachers and their students. The 450 page curriculum was pilot tested in 45 Colorado schools. It includes seven areas of food safety: food safety overview, food irradiation, animal antibiotics and hormones, fat/sugar substitutes, microbiological contamination, pesticides, food additives, and biotechnology. Each unit includes background information, activities, references, interdisciplinary teaching matrix, glossaries, and student test questions. This can be used as a Food Safety course, or as a supplement to existing curricula."

15. Over the past year or two in what ways have you personally become more aware of food safety issues? How did you gain this information?

16. What, if anything, have you taught students about food safety? What specific food safety topics have you discussed with students? If not discussing food safety, why not?

17a. What materials / activities did you use to discuss the topics you just described? What made you decide to use these materials?

17b. In what settings did you provide this instruction (e.g. classroom, nurses office, other)?

18. Looking back on the discussions you've had with students, what would you like to have done better? What would have made the lessons you taught more effective?

19. What was the students' reaction to these food safety messages?

20. What did you hope to accomplish by educating students with these discussions? What were your goals?

21. At what grade level do you think food safety lessons would be most effective? At what grade level do you think students will be most responsive and receptive to this message?

22. How did you decide that a food safety message was needed? (PROBES: school mandate, personal interest, other)

23. What are the most important messages to convey?

24. In your opinion, in what part of a typical curriculum should food safety be taught? (PROBES: health, home ec., "science," school health clinic or department, other)

25. Is food safety a good fit educationally for your job and your role in the schools that you serve? How can a strong food safety message best be presented to students that you serve? Why?

26. How have teachers in your school taught food safety in the past? In what context have they taught food safety? What other avenues might be appropriate? Why?

27. What priority do you place on food safety education? What priority do others place on it (e.g., teachers, administrators, parents, nurses, etc.)?

28a. **IF FOOD SAFETY IS NOT IN PLACE, ASK:** What would the process be for getting a food safety curriculum in place in your school? What avenues would have to be pursued, and with whom? Do you perceive food safety as a priority issue? What are the barriers to teaching about food safety in the schools?

28b. **IF FOOD SAFETY IS ALREADY IN THE SCHOOL, ASK:** "Who has been involved to date in getting food safety into your district? What was the adoption process?"

29. Beside the school food service staff, who else in your school plays a role in food safety education? Are these better venues for a food safety message than via school food service personnel? Why or why not?

30. What should the educational goal for a food safety curriculum be? How would this vary with the age of students? How would this vary with the subject to which the food safety curriculum is linked?

31. What are the advantages and disadvantages of the media and materials you use to educate students about food safety? Do other school staff prefer to use these media and materials as well? (PROBE: technologies)

32. To what degree is technology infused into your schools instructional program? Do you and/or the students in your school have easy access to interactive multimedia equipment and applications? Do you and/or the students in your school have easy access to the Internet?

33. Given a choice between different delivery mechanisms, which would you choose and why? What are you most likely to use, and why?

Appendix B

List of Documents Reviewed in Preparation of this Report

Fostering the Use of Educational Technology: Elements of a National Strategy

Universal Access to E-Mail: Feasibility and Societal Implications

School Health Policies and Practices Study

Study of School Uses of Television and Video

Analysis of Trends of School Use of New Information Technology

America's Teachers: Profile of a Profession

Digest of Educational Statistics

The Condition of Education 1994

A Nation at Risk

Technology in Public Schools, QED's 13th Annual Census Study of Public School Technology Use

Reforming Education for Work: A Cognitive Science Perspective

Education and Learning to Think

Special Issue on Educational Technologies: Current Trends and Future Directions

Healthy People 2000: National Health Promotion and Disease Prevention Objectives

Healthy Communities 2000

Nutrition Guidance for the Child Nutrition Programs

Creating an Agenda for School-Based Health Promotion

Comprehensive School Health Education Programs: Innovative Practices and Issues in Setting Standards

School Health in America: An Assessment of State Policies to Protect and Improve the Health of Students

School Nursing: Trends for the Future

Guidelines for Comprehensive School Health Programs

Report of a National Survey of School Nurse Supervisors

The Surgeon General's Report on Nutrition and Health

Product Name	Date of Publication	Author/ Developer	Media/Format	Target Audience	Content Coverage/ Organization
Growing Healthy: Coming to Terms with Germs, Germ Terminators	1997	National Center for Health Education	Curriculum guide (includes student handouts)	Grades 4-6	See description for K-3 version.
Growing Healthy: Coming to Terms with Germs, Germs from A-Z	1997	National Center for Health Education	Curriculum guide (includes student handouts)	Kindergarten-Grade 3	Covers all types of germs (e.g., colds and flu, minor cuts and scrapes). This is part of a comprehensive school health program, the Growing Healthy series. The emphasis really seems to be on germs and on treating cuts, scrapes, and other wounds.
Handwash Motivation Aids	Ongoing	Brevis 3310 South 2700 East Salt Lake City, UT 84109 800-383-3377 Fax: 801-485-2844	Posters, slickers, pencils, T-shirts, mugs, balloons, buttons	Food service workers, children, adolescents, youth, consumers	Brevis offers several ways of conveying handwashing techniques to consumers, food service workers, and health care workers. Materials for children include the books <i>Buddy Bear's Handwashing Troubles</i> , <i>Ten Potato Scrub</i> , and the <i>Germ Gang Activity Book</i> .
Incredible Journey from Hen to Home, The	1991	American Egg Board 1460 Renaissance Dr. Park Ridge, IL 60068 847-296-7043 http://www.aeb.org/	Curriculum includes game, book-marks, teacher's guide with plans for seven lessons, activities, and a reading list	Youth	Cross-curricular educational unit designed for youth in grades 4 through 6. Lessons include real-life problems that help teach not only the basic skills of language arts, math, science, nutrition, food safety, and consumer education, but also enrichment skills by means of logic puzzles, cooking, economic decision-making, and creativity. Throughout the 30- to 40-minute lessons, the class or group will be learning how to learn by comparing, contrasting, analyzing, and evaluating. Each lesson is designed to encourage active participation in the learning process.
Introduction to Kitchen Safety: Disasters Waiting to Happen	1991	The School Company P.O. Box 5379 Vancouver, WA 98668 206-696-3529	Curriculum includes videocassette (15 min.) and teaching manual with activities.	Adolescents, youth	Video for young people just beginning to become independent; teaches about basic food safety. A chef teaches about proper refrigerator temperature, heating and cooling foods, cross-contamination, storing leftovers, thawing frozen foods, storing foods in the freezer, storing produce, and observing pull dates on foods. Using knives and how to prevent shocks and fires in the kitchen are also discussed. (The narrator states that the danger zone is 80 to 140 degrees F., but gives proper temperature for refrigerator.)
Kitchen Safety Game	1995	Pineapple Appeal, Inc. P.O. Box 197 Owatonna, MN 55060 507-455-3041	1 game board, 1 die, 4 playing pieces, 6 sets of cards, 1 set of rules, 1 set of study questions	Youth	Designed for children in grades 6-9, this game covers kitchen safety, food safety, emergency techniques, "cleaner is safer," and common sense in the kitchen.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Let's Have a Killer Cookout—NOT!	1997	Mark Tamplin Institute of Food and Agricultural Sciences Building 120, Room 103 Newell Dr. University of Florida P.O. Box 110365 Gainesville, FL 32611 352-392-2030 Fax: 352-846-1102 E-mail address: mlt@gnv.ifas.ufl.edu Order from Lighthouse Education and Design Inc. 825 23rd Ave., Suite 1-B Gainesville, FL 32609 352-376-4888 http://www.foodsafety.org/train.htm	CD-ROM multimedia	Grades 4-12 children, youth, adolescents	This interactive program teaches youth about food safety from the grocery store to the kitchen. A student evaluation package allows teachers to track students' progress and learning. Lessons and games in grocery store and home kitchen settings. Includes quizzes and a tracking system that informs the teacher of student's progress. Uses the idea of a food safety chain. Topics covered include buying and transporting food, safe storage, and safe food preparation.
Meeting the Food Safety Needs of Bilingual and Low Literacy Youth	1995	April Mason Purdue University Cooperative Extension Service 1264 Stone Hall Purdue University West Lafayette, IN 47904-1264 765-494-8539 Partner: University of Florida	Videocassette (13 min.), audiocassette, lesson plan	Grades 4-6; children and youth (including those with low-literacy skills); Spanish version available	Kit consists of the video "The Mystery of the Poisoned Panther Picnic" in both English and Spanish (the Spanish video is a dubbed version of the English tape); two audiocassettes (Panther Picnic pre- and post-test and "Path-O-Gens Are on Your Path—a rap song); a teacher's guide; and student handouts.
Mystery of the Poisoned Panther Picnic, The	1992	April Mason Purdue University Cooperative Extension Service 1264 Stone Hall Purdue University W. Lafayette, IN 47904-1264 765-494-8539	Videocassette, overhead transparency masters, game cutout sheets, background fact sheets	Children, youth Spanish version available	Curriculum to help 4th, 5th and sixth-graders see how they fit into the food safety system; consists of five sequential lessons along with an optional field trip activity.
Operation Risk	1992	Pat Hammerschmidt Michigan State University Extension MSU Bulletin Office, 10-B Agricultural Hall Michigan State University East Lansing, MI 48824-1039 612-355-0240 or 517-355-6586	Curriculum includes four lessons (15-25 minutes each), teacher/leader's guide, activities, videocassettes, poster, handwashing rap audiocassette tape, and an interactive computer game called "Risk Raiders" (for Macintosh and Windows).	Children in grades 3-5; school use of 4-H and EFNEP	A curriculum designed to assist in teaching the hows and whys of safe food handling. Through this curriculum, kids explore ways to ensure their own health by learning what they can do to prevent food-borne illness. Kids assume the role of detectives as they work through this multimedia program with fun-to-solve cases, missions to complete at home with an adult, and a variety of learning activities designed to challenge young problem solvers.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Operation Risk Tele-conference	1995	Pat Hammerschmidt Michigan State University Extension MSU Bulletin Office, 10-B Agricultural Hall Michigan State University East Lansing, MI 48824-1039 612-355-0240	Videocassette (120 min.)	Educators	Originally aired as a live videoconference on 4/20/93. Discusses food-borne illness risks for children.
Play It Safe: Goals for Food Safety	1990	Food Marketing Institute 800 Connecticut Ave. NW, Suite 500 Washington, DC 20006-2701 202-429-8298 http://www.fmi.org Partners: USDA, AMI, FMI, IFIC, NAWGA, NFI, NFPA, NGA, NTF, PMA, UFF&VA, AAP	Print materials: 16-page workbook, game board	Children, youth	Booklet contains four lesson plans, each complete with objectives, background information, teaching strategies, and optional activities. Complementary activities included with each lesson plan can be duplicated and distributed to the class. A resource page provides further information, including correlation of materials with appropriate textbooks. Also includes a simple yet challenging game, called "Play It Safe."
Producer Through Consumer—Partners to a Safe Food Supply	1992	April Mason Purdue University Cooperative Extension Service 1264 Stone Hall Purdue University West Lafayette, IN 47904-1264 765-494-8539	Curriculum includes lesson plan, camera-ready masters, factsheets, overhead transparencies, video.	Professionals, children, youth	This curriculum has as its objective to teach major food safety issues. Using lecture, news articles, brochure, and video formats, the lesson covers microbial contamination, pesticides, and food-borne illness. The accompanying reference manual consists of summary papers on 29 food safety topics and is meant as a tool for extension agents to use in answering the public's food safety questions, for preparing a program, or gaining background information. There are separate curricula for adults and children. The adult version comes with an adult curriculum guide and the video "Producer Through Consumer", while the children's version comes with a youth curriculum guide and the video "Mystery of the Poisoned Panther Picnic." The kit can be bought in its entirety or as separate pieces.
Project Food Safety—Educational Units for the Middle Level Science Classroom	1992	Phyllis Dennee Montana State University Extension Service Extension Publications Rm 115, Culbertson Hall, Montana State University Bozeman, MT 59717 406-994-3273	Curriculum includes three teacher's guides with lesson plans, pre- and post-test, and activities.	Youth, adolescents	Project Safety consists of three different modules for middle-school youth. The 8th-grade unit is about food irradiation; the 7th-grade unit focuses on pesticides; the 6th-grade unit topic is microbial contamination. The units can be purchased together or separately. The major concepts taught in the microbial-contamination unit are the "danger zone" and cross-contamination. Two laboratory activities, along with several reinforcement activities, make up this unit's content, which probes the subjects of food poisoning, bacteria treatment and prevention, and characteristics of bacteria and bacterial growth. The units were designed to be easily incorporated into the present science curriculum at each grade level. Supplemental videocassettes instruct the teacher on how to prepare and conduct the science experiments. The cassettes are ordered separately from the workbooks.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/Organization
Rockin' Hand Washin' Report, The	1991	Joanne Haich Portland Public Schools Television Services 5210 North Kerby Portland, OR 97217 503-280-5838	Videocassette (9 minutes)	Adolescents	"The Spy Cam doesn't lie, Man!" is what two teenagers discover when they are confronted with roving Rock-and-Roll Reporter Jim-Bo-Dee in the restroom of their local high school. Jim-Bo-Dee, along with his collection of offbeat medical professionals (Dr. Dude and Nurse Ann), teaches the importance of handwashing to prevent the spread of disease. Although aimed at high school and middle-school students, <i>The Rockin' Hand Washin' Report</i> video has proven effective with all ages and gets across the important message: Wash your hands to prevent spreading disease.
Safe Food for Children	1992	Mary P. Clarke or Paula Peters Kansas State University Cooperative Extension Service Justin Hall 244 Kansas State University Manhattan, KS 66506-1407 913-532-5782	Videocassette for children (46 min.), videotape for leader (1 hour), five leader's guides (one for each lesson), silckers, magnet, certificate of completion	Child care providers, trainers	This curriculum is designed for parents, other child care providers, and trainers of child care providers. It consists of five lessons of 30 to 45 minutes, each with key lesson concepts, materials needed to teach the lesson, discussion to accompany video, activities for adults and for children, questions and answers, resources, and reproducible masters. The Lessons are 1) "Clean hands for healthy children"; 2) "On your mark, get set, go grocery shopping"; 3) "Recipe for success: Prepare and serve food safely"; 4) "Microbe family get away! Storing food smartly and safely"; and 5) "Clean kitchen savvy." Video is to be used with the lessons.
Safe Food for Children Brochures	1992	Mary P. Clarke or Paula Peters Kansas State University Cooperative Extension Service Justin Hall 244 Kansas State University Manhattan, KS 66506-1407 913-532-5782	Set of five folding brochures	Child care providers, trainers, consumers	This set of five brochures that were developed for the Safe Food for Children curriculum can be used alone, without the rest of the curriculum. Titles are 1) "Clean Hands for Healthy Children," 2) "On Your Mark, Get Set, Go Grocery Shopping," 3) "Microbe Foiled Again," 4) "Microbe Fam-ily Get Away!," and 5) "Clean Kitchen Savvy."
Safe Food Healthy Children—A Food Safety Teleconference Workshop for Child Care Providers	1995	Judy Harrison University of Georgia Cooperative Extension Service Hoke Smith Annex Athens, GA 30602-4356 706-542-3773	Facilitator's manual, participants' packet, camera-ready copies, videotape (85 min.)	Child care providers	This curriculum contains the materials used in a teleconference to train child care providers in food safety issues. The program was designed to be 4 hours long but may be broken into shorter segments to accommodate other time schedules. The training consists of short video segments interspersed with participant activities.
Safe Food Journey	1996	Barbara Selover National Cattlemen's Beef Association 444 N. Michigan Ave. Suite 1800 Chicago, IL 60611 800-368-3138	Poster, activity sheets, lesson plan	Youth, children	Introduces children to food safety principles by showing foods as they journey from farm to table. Refrigeration, labeling, handwashing, and safe food handling concepts are taught.

Product Name	Date of Publication	Author/Developer	Media/Format	Target Audience	Content Coverage/ Organization
Serve It Safe: A Manager's Tool Kit	1996	USDA/Food and Consumer Service Nutrition and Technical Services 3101 Park Center Dr. Room 607 Alexandria, VA 22302 Limited copies for sale from National Food Service Management Institute, 800-321-3054. Distribution planned for all State agencies and 23,000 school districts beginning in fall 1996.	Teacher's manual, teaching aids, poster, multimedia instructional modules entitled "The Food Safety Zone" Curriculum includes lesson plans for eight chapters, group exercises, handouts, overhead masters, job aids, poster, and interactive computer software (CD-ROM and diskettes for Windows or Macintosh)	School and other food service managers and staff	This curriculum was designed as part of the Team Nutrition campaign for use with school food service but is also applicable to other food service organizations. Consists of eight chapters that include lesson plans, talking points, objectives, overhead masters, and activities. The interactive software can be used separately to reinforce ideas in the teaching modules. Covers hazard identification and control; the importance of temperature, time, and pH; causes of food-borne illness; and keeping a sanitary, not just a clean, kitchen.
Tosha's Day	1992	University of Kentucky, Cooperative Extension Service 233 Scovell Hall Lexington, KY 40546 606-257-1812	Laminated 8½ x 11-inch story board	Young children	The pictures and simple text tell the story of Tosha, a little girl who got sick. It goes through what she did the day before and how that may have contributed to her illness.
Wash Those Hands!	1996	Marsh Media Contact: P.O. Box 8082 Shawnee Mission, KS 66208	Videocassette (9:26 min.) close-captioned	Consumers, adolescents	Designed for all ages, this video presents concise information about basic personal hygiene, including a look at germs and how they make people sick. Handwashing techniques are taught.
Wash Your Hands	1995	Lyle Branchwater LWB Company 13614 56th Ave. NE Marysville, WA 98271 360-653-9122 Partner: Centers for Disease Control and Prevention	Videocassette (5½ min.), booklet	Consumers, food service workers, adolescents; available in Spanish	Robert starts to leave a restroom without washing his hands. A Voice from Beyond tells Robert that he didn't wash his hands. A frightened Robert washes—but not well enough. The Voice shows Robert the germs on his hands and gives him detailed washing instructions.

Appendix D

Bibliography

Appendix D

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